Integrating Sustainability Measures and Practices in the Ethiopian Industrial Parks: From Review to Conceptual Model

Fitsum Getachew Bayu[1(✉)], Frank Ebinger[2], and Eshetie Berhan[1]

[1] School of Mechanical and Industrial Engineering, Addis Ababa Institute of Technology, Addis Ababa University, Addis Ababa, Ethiopia
fitsum.getachew@aait.edu.et

[2] Department of Sustainability-Oriented Innovations and Transformation Management, Nuremberg Campus of Technology (NCT), Technische Hochschule Nuremberg, Nuremberg, Germany

Abstract. Sustainable performance demands to show a sustained competitive advantage that lasts a long period. "Industrial Parks" is now the gateway to sustainable development, especially in the least developing countries like Ethiopia, for example. The industrial parks are highly attracting foreign direct investment and working for the inclusive development of the country. Though this is a good start, the capability is at an initial stage and needs support in terms of their performance towards creating a sustainable operation. Based on the evidence of both theoretical and empirical literature findings, this study paper conducted a review and identified the sustainability measures and practices from which it tries to filter the key capability measures and practices for the Ethiopian industrial parks. For integrating the identified practices and measures, as a methodological approach, the theory of dynamic capability process is considered, encompassing sensing, learning, and transforming the cyclic loop. Practices and measures are incorporated in each process of dynamic capability pillars. A conceptual model was developed as the final output showing the holistic map of the integrated sustainability measures and practices. The measures and practices identified will fully support the sustainable growth and decision process of the industrial park operation. It also adds value to the body of knowledge in industrial sustainability in special economic zones.

Keywords: Sustainability measures · Sustainability practices · Ethiopian industrial parks · Dynamic capability

1 Introduction

Industrial parks or zones are set of business within a specific geographical area which shares resources and thereby increase profitability, reduce environmental impact, and improve social performance. The concept of industrial parks emerged during the 1990s and 2000s with so-called special economic zones. Industrial parks (IP) are an agglomeration of different firms operating in a given demarcated area following a sustainable business model. IP business models aim for a significant impact on the

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environment and society through changes in the way firms create and capture value (change their value prepositions) [1]. The business model goes beyond the economic value and addresses the other triple bottom line dimensions (environment and social).

In the current economy, countries in the least developing countries like Ethiopia are considering industrial parks as a policy instrument for economic growth. Ethiopia introduced the concept of "Industrial Parks" lately, 2012/13, and showing now a progressive change to the country's economic development. The government of Ethiopia targeted industrial parks as a major policy tool for the success of the Growth and Transformation Plan (GTPII), which runs to 2025 to transform Ethiopia into a global manufacturing hub.

According to recent literature, the current global economy pushes firms to think beyond their profit and consider the planet and people in the operation process [2]. This situation is important and sensitive to special economic zones and the Ethiopian industrial parks to sustain the development and performance and gain sustainable outcomes. Therefore, park operation management requires a holistic, customized system comprising the sustainability measures and practices, which the Ethiopian industrial parks lack in their current situation [3]. This has also still being a challenge in other countries of least developing countries, due to lack of awareness, lack of involvement of sustainability metrics, and organization structuring problems are some to mention [4].

Integrating sustainability measures and practices require customizing the generic indicator variables of sustainability measures and practices according to the operation process of Ethiopian industrial parks [5]. This is because literature developed several indicator variables and practices for sustainability in economic, social, and environmental pillars, but incorporating these variables at the firm's level requires customizing according to the firm characteristics and operation [6]. Therefore, this study paper conducts a review and identifies the sustainability measures and practices from which it tries to filter the key capability measures and practices of sustainability (economic, environmental and social) for the Ethiopian industrial park case. Moreover, the study develops a holistic framework showing how the practices and measures are integrated as a system.

2 Literature Review

2.1 Sustainability and Its Measures

Sustainability as a group of actions taken to meet the needs of the present moment without committing to future capacity [7]. Sustainability is the ability to maintain profits as expected by shareholders, manufacture without damaging the environment, and improve the quality of lives of stakeholders [8]. Several works of literature in the recent era of research are focusing on integrating sustainability indicators. Sustainability in the manufacturing industries has been an important aspect; several methods have been developed to assess sustainability at the firm level. However, most of the methods do not consider the holistic dimension of economic, social, and environmental indicators. Previous thoughts on creating long-term success with only focusing on financial aspects now widened by considering environmental and societal issues. These areas are now studied in the pillar of sustainability, incorporating people, planet, and profit. Jaehn [9]

Definitions regarding operation sustainability where a system is called sustainable if the environment influences the system so that it can exist permanently. The "permanent existence" of a system is not to be understood in a strict sense but instead in the sense of a very long time horizon. Kleindorfer [10] articulated that organization management is connected to sustainability, and it is now focusing on both operational drivers of profitability and their relationship to people and the planet. As cited by Gimenez [11] sustainable operation is defined as the set of skills and leverages that allow a company to structure its business process to achieve lasting performance [12].

Performance dimensions encompass the social aspect, mainly employees in this study, economic aspects of business indicators, and the environment. Sustainable operation management (SOM) includes the strategies, techniques, and practices to support these triple bottom sustainable dimensions [13]. Sustainable operations can also be seen as a system for aligned business activities throughout the product lifecycle to create value to stakeholders, commercial success, people's well-being, and the environment [14]. For achieving sustainable operations, Firms have to contemplate the three dimensions of TBL. However, the challenge is to define the relevant indicators for each dimension and understand how they connect to achieve a sustainable process. Table 1 shows the sustainability indicators in the literature.

Table 1. Sustainability measures; Source [15]

Area of performance	Category	Core indicators	Authors
Economic	Cost management	Return on investment	[16–20]
		Environment investment	
		Export sales	
	Operation efficiency	Productivity	
		Products quality and services	
		Lean manufacturing wastes	
	Suppliers	Number of suppliers	
		Just in time	
		Standards for suppliers	
	Customers	Number of complaints	
Environmental	Environmental management	Policy/standards; compliance cost; certification	[21–24]
	Environmental aspect	Suppliers with environment	
		Company image with environmental	
	Responsibility consumptions	Treatment/disposal of waste	
		Consumption of water, energy	
Social	Economic	Salary and benefits	[19, 25–28]
	Satisfaction level	Level of employee satisfaction; Absenteeism; turnover; health programs and safety employees; ergonomics	
	Human resource	Availability of skilled labor	
		Recruitment; performance evaluation	
	Health and safety	Accidents	
		Injuries	
		Personal protective equipment	

2.2 Sustainable Practices: Lean and Green

Sustaining competitiveness in the market demands to overcome external and internal pressures such as; regulations and fulfilling standard requirements, the need for the customer, supplier relationship, employee management, etc. [29]. These mentioned concerns ultimately influence firms and shake their sustainability in the global business. Therefore, focusing on sustainability, incorporating the operational, social, and environmental factors is taken as their primary goal beyond their operational gain. Integrating sustainability at the firm level and creating a balance within the operational production performance is challenging. The main reason because it demands to create a simultaneous outcome that balances the gain in profit, environment, and human capital development.

To compromise the above challenges and build sustainable operation capability resulting in a balanced outcome in all the three aspects of sustainable dimensions, academic authors and practitioners are giving attention to utilizing sustainable manufacturing philosophies. The lean and green philosophes are exemplary and most researched themes. The strong commonality that the two have to address sustainability paved the way for researchers to utilize them as balancing mechanisms for sustainable manufacturing. These philosophies compromise different practices both at technical and soft levels. The technical or hard practices are used to achieve process-level performances such as production cost, delivery, quality, and flexibility [30]. At the same time, the soft practices are oriented to people and organizations aiming to capitalize on the employee, customer, supplier, and management [31]. Lean and green practices have been spreading widely both in service and manufacturing industries, both targeting operational and environmental performance [32, 33]. Today, the techniques are applied beyond the manufacturing aspect and taken as management or thinking approaches in various organizations [34].

Table 2. Critical Lean-Green practices for sustainable performance

Practice bundles	Sub-variables	Authors
Soft practices	Environmental and social investments	[30, 35, 36]
	Eco-design and certifications	
	Green branding and promotion	
	Standardized and flexible working system	
	Employee engagement and participation	
	Sustainability awareness programs and leadership	
	Sustainability oriented training and job empowerment	
	Customer and supplier network	
	Communication platforms/channels	
Technical/hard practices	Lean tools (5S, TPM,VSM,QMS/ISO9001/)	[37–40]
	Green tools (Green VSM, Green purchasing, ISO1400, OHS/ISO45001)	

3 Methodological Approach and Theory Building

3.1 Methodological Approach

Building sustainable capabilities and performance requires integrating sustainable measures and practices. The integration requires a systematic approach. In this paper study, both theoretical literature and empirical review and investigation were conducted. The theoretical review was done to identify core sustainable measures and practices. Moreover, as a theoretical approach, the concept and dimensions of dynamic capabilities were also reviewed accordingly. With the support of theoretical knowledge, an empirical review was conducted to understand and identify the interference variables involved in sustainability measures and practices of Ethiopian industrial parks. As a supporting method, the review findings were further triangulated through interviewing operation managers, stakeholders, and foreign investors in the park.

Moreover, secondary research reports in the park performances were also used for better substance the outputs from the qualitative results. Basing both theoretical and empirical outputs, a conceptual model that helps assimilate sustainable practices through the use of the dynamic capability approach and build sustainable performance of industrial parks has been forwarded. This conceptual model creates a platform where dynamic capabilities are assimilated and help managers visualize the critical measures and practices for sustaining the park's performances. Understanding these variables aid in better decision-making and opens for early learning of dynamic situations. The conceptual model developed for EIP, aiming to reconfigure the existing static operational capabilities, takes the base of [41] theory. The theory of dynamic capabilities and their routines has taken as a base to influence the existing operational capabilities of the industrial park where the park operational influencing variables in social, economic, and environmental, and resources are taken as moderating variables. Operational capabilities reconfigured in such a way finally influence the sustainable performance of the parks (Fig. 1).

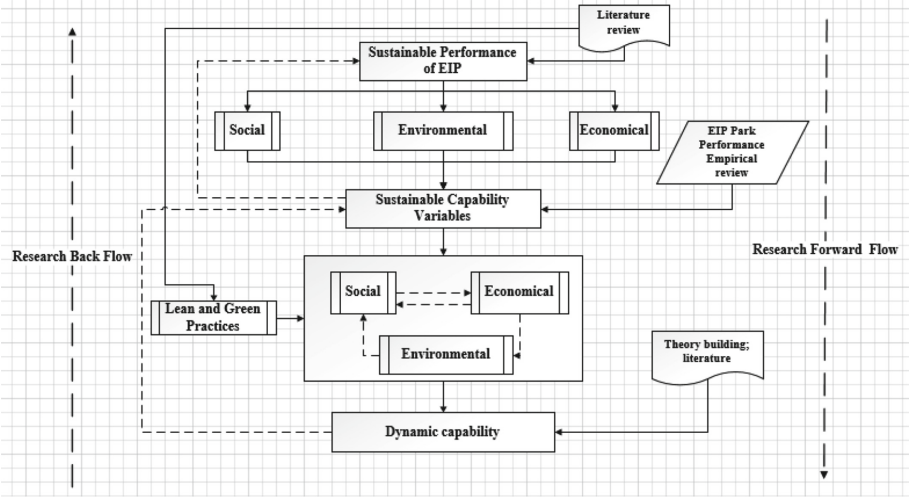

Fig. 1. Research framework

3.2 Theory Building: Dynamic Capabilities

Dynamic capabilities view originates in spirit from Schumpeter [42] innovation-based competition where competitive advantage is based on the creative destruction of existing resources and novel recombination into new operational capabilities. These ideas were further developed in the literature, such as architectural innovation [43], configuration competence [44], and combinative capabilities [45]. Extending these studies, [46] developed the notion of dynamic capabilities, and their seminal paper is considered the most influential source on dynamic capabilities, together with a current framework of dynamic capabilities [47]. The dynamic capabilities view follows the resource-based view (RBV). In contrast, RBV emphasizes resource picking (selecting resource combinations), dynamic capabilities stress resource renewal (reconfiguring resources into new combinations of operational capabilities). The DC theory suggests competitive advantage comes through leveraging a firm's managerial and organizational processes and developed through the integration of intangible assets and capabilities with a dynamic environment. This theory has become one of the most influential theoretical lenses in the firm's strategic management in today's changing global market. The term "dynamic" translate as the capacity to renew competencies so as to achieve congruence with the changing business environment. Dynamic capability concept originally defined as the "firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" [48]. Competency reflects the managerial and organizational process or patter of practices and learnings. Eisenhardt [49] also subsequently defined dynamic capabilities as "the firm's process that uses resources to match and create market change". The authors also outlined examples of dynamic process such as product development routines, resource allocation routines, knowledge transfer routines. Another evolution of dynamic capability is focused on organizational learning, where it is considered as a source of dynamic capability. In this context, Zollo [50] defined it as "a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness".

Therefore, this paper takes the dynamic capability view theory to integrate sustainability measures and practices.

4 Sustainability Measures and the Existing Situation in EIP

Based on the international framework for Eco-industrial parks, the performance requirements of industrial parks are categorized into four key categories: park management performance, environmental performance, social performance, and economic performance [51]. In general, park management related to infrastructures, organizing services, standards, and marketing and promotion of the park is the key activities. Environmental aspect dimensions are related to the effective management of resources, including water, wastewater, and climate change issues. The economic aspect of the industrial park focus on maximizing possible returns for business through revenue

generation, job creation and competitiveness. The social aspect dimensions address the need of employees and the community around. Worker's management, safety and health and appreciating social incentives and infrastructures are some indicators. These performance requirements increase park management performance and improve the sustainability performance of the industrial parks. The following section summarizes the measures and gives a highlight summary of the existing situation of the version of the park in social, environmental, and economic aspects based on the empirical review and reports of [3, 52, 53]. To understand the existing sustainability of the park, cause and effect analysis is considered. Data required to identify the park's critical causes for limited performance is collected through both primary and secondary approaches. Observation, interview of managements, focus group discussion used as primary data and reports and documents utilized as secondary data.

4.1 Environmental Measures

Environmental sustainability focuses on tasks that will protect vital environmental functions for the future generation. It focuses on product lifecycle, operation process, and integration of supply chains [54]. Key indicators in industrial parks or special economic operations focus on the consumption level of energy, material use, emission. Energy efficiency strategies should be in place for the park management infrastructure and major energy-consuming park operators. Moreover, platforms for the exchange of energy and heat networks should be established in the park. Water-saving and reuse plans are also other essential to reduce total water consumption. System building in place to increase water saving and reuse. The same platform, low carbon technologies, and energy efficiency measures, and waste heat to reduce GHG emissions are essential for the high carbon emission manufacturing sector. On top of all the management and monitoring is critical for the sustainable operation, industry park has an appropriate, functioning environment and energy management system such as ISO14001 and ISO50001 respectively in place and achieves targets.

Based on evaluating the above objective of environmental sustainability, the EIP performance is at the initial stage. The authors' performance reports outlined and preliminary investigation shows that there is low awareness in adopting environmental management practices, capacity concerning knowledge of skills in utilizing and managing green technologies such as zero-liquid discharge. The adoption of regulation and international standards and certification is also at the low stage and is supported by international donors and experts. The below summary in Fig. 2 shows the environmental performance analysis with the EIP's primary root causes and effects.

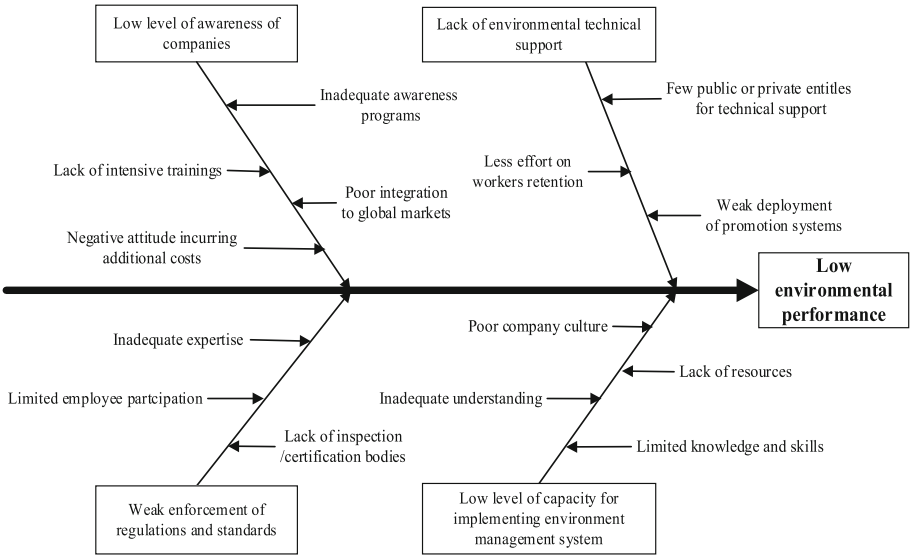

Fig. 2. Environmental sustainability situation in EIP (Authors findings)

4.2 Social Measures

Social sustainability aims to address the social aspects related to the human factor. Variables such as health and safety, salary and benefits, work satisfaction are considered as social sustainability indicators. Indicators focus on social aspects by creating job satisfaction, reducing absenteeism, improving the company image and productivity. Moreover, the absence of building awareness and delivering motivational training, employee recognitions are the core causes of high turnover and low productivity performance. Social management systems, including functioning systems, should be in place to ensure social infrastructure operational and performance and collect, monitor, and manage social innovations and impacts relevant to the industrial park. Implementing, OH&S management system in place based on ISO18001 standard, keep record rate of injury, occupational disease, absenteeism. Grievance management mechanisms should be in place, such as help desks, complaint boxes inside the industrial parks.

Furthermore, the social infrastructure focusing on primary infrastructures such as women's employment encouragement, public toilets, drinking water fountain, cafeteria, recreation areas, and childcare programs. Industrial park security including closed-circuit televisions (CCTV), centralized security, and night transportation provisioning. Capacity-building programs for skills training and development by employee category should be in place. Examples like training and skills development programs and women entrepreneurship development programs.

The social aspect comprises essential measures, and for EIP working in light industries focusing on the labor-intensive sector is crucial. Regarding social sustainability issues, the EIP is facing many challenges and is still in the process of managing the challenges. Key issues raised in the social aspects are; absenteeism, communication and cultural gap, salary and benefits, turnover rates, and worker's safety. Below the summary, Fig. 3 shows the social performance analysis with the EIP's major root causes and effects.

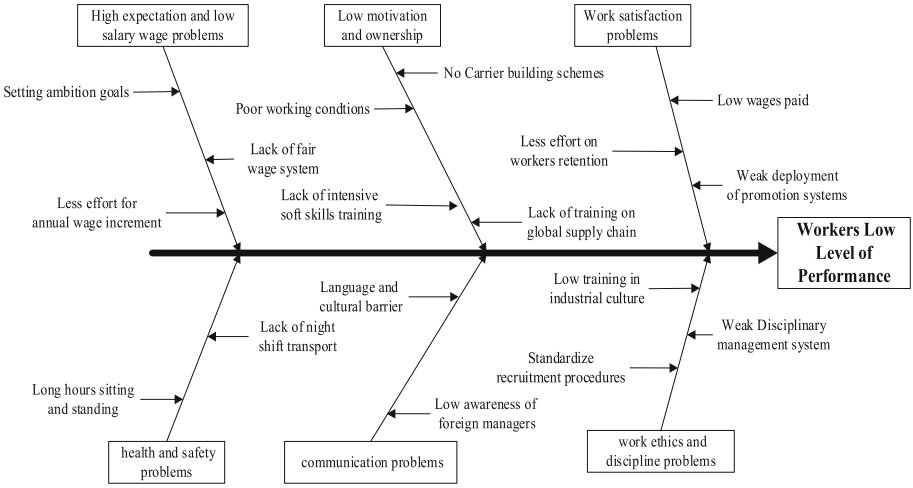

Fig. 3. Social sustainability situation in EIP (Authors findings)

4.3 Economic Measures

Economic sustainability performance is linked to the profitability of the firms. The decision-making in this aspect focuses on the investment ratio and its return according to the investor's expectation. Economic indicators contribute to managing the economic characteristics of the industrial parks and the effectiveness of actions for sustainability [55]. However, the integration requires sub-variables linked to the cost factors. In the case of industrial parks, employment generation is a core target in building local employment opportunities in countries like Ethiopia.

Moreover, longer-term employment to employees is one requirement for sustainable economic performance. Efforts in supporting local business and small and micro enterprises promotion through integrating local suppliers and local investors partnered with the multinational companies. This provides an increase in the growth of local business opportunities. Besides, economic value creation through making investment ready and essential infrastructure service should be offered, including access to water, energy, road, and logistics service.

The above existing situation of social and environmental challenges of the EIP impacted the economic value of the park. It has negatively impacted the factory efficiency and productivity level. On top of this situation, the administration and infrastructure process is at low-level needs encompassing the social and environmental aspects. Issues in aligning the business model in the Ethiopian industry culture are also another challenge faced by foreign investors. The local sourcing process of suppliers is at low capacity in terms of delivery and quality of the product, influencing the production and economic sustainability.

Below the summary, Fig. 4 shows the social performance analysis with the EIP's major root causes and effects.

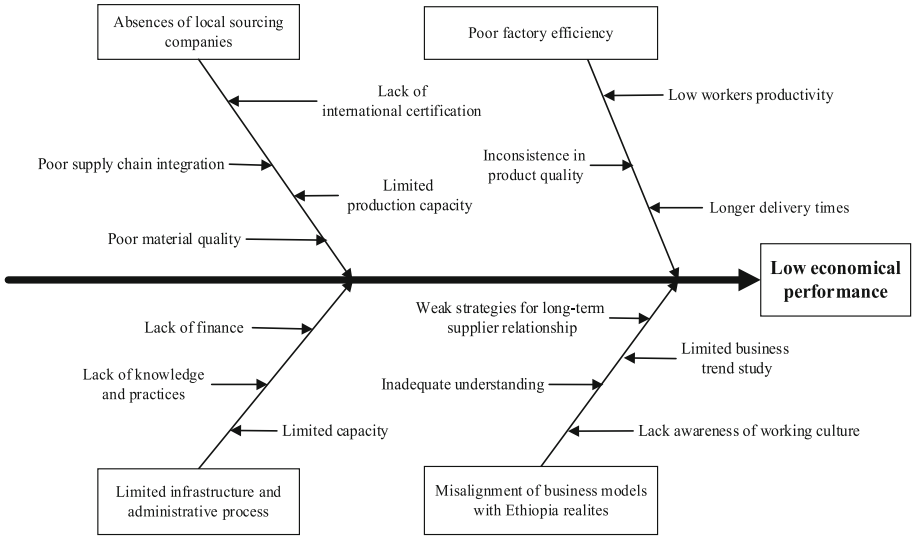

Fig. 4. Economic sustainability situation in EIP (Authors findings)

Basing the above sustainability measures and the existing situation of the EIP, a summary of the key sustainable capability measures is shown in Table 3.

Table 3. Customized sustainability measures for EIP

Capability bundles	Core influencing variables EIP level	Sub influencing-variables
Social aspect (employee)	Job satisfaction	Salary, incentives, and allowance
		Workers retention/attrition
		Absenteeism
	Motivation and commitment	Carrier building schemes
		Working conditions
		Hard and soft skills training
	Health and safety	Night transport availability
		Sitting and standing hours
		Sick leaves
	Communications	Language
		Communication channels
		Information standardization
	Work ethics and discipline	Workers discipline
		Workers industrial ethics and culture

(*continued*)

Table 3. (*continued*)

Capability bundles	Core influencing variables EIP level	Sub influencing-variables
Environment aspects	Technical supports	Public/private consulting entities
	Environmental awareness	Awareness programs
		Environmental management training
		Workers Attitude and perceptions level
	Regulations and standard	Local expertise
		IP policy
		Local Inspection and certification bodies
Economic aspects	Factory efficiency	Workers productivity
		Delivery times
		Product quality
	Local sourcing	International certifications
		Local suppliers product quality
		Local supplier producing capacity

5 Proposed Conceptual Model

Incorporating identified sustainability measures and practices from the theoretical and empirical review, a conceptual model is developed, shown in Fig. 5. The model follows a continuous loop starting with the inside and goes outside and has three loops. The first and the core center process is the dynamic capability of the EIP, which is sensing, learning, and transforming ability. The sensing embraces the lean-green practices (Table 2) that lead to more opportunity; the learning containing the practices that support the capability building; and the final the transforming considers lean-green tools that transform the sustainable knowledge and practices into the routine level. The second loops are critical capability variables in EIP in social, economic, and environmental levels summarized in Table 3. This second loop is impacted by the first loop of lean-green practice in the DC process. The practices in the DC process contribute to the capacity-building process in all the triple bottom dimensions accordingly. In the final stage, the second loop of the capability variables impacts the final loop of the sustainability performance measures (Table 1).

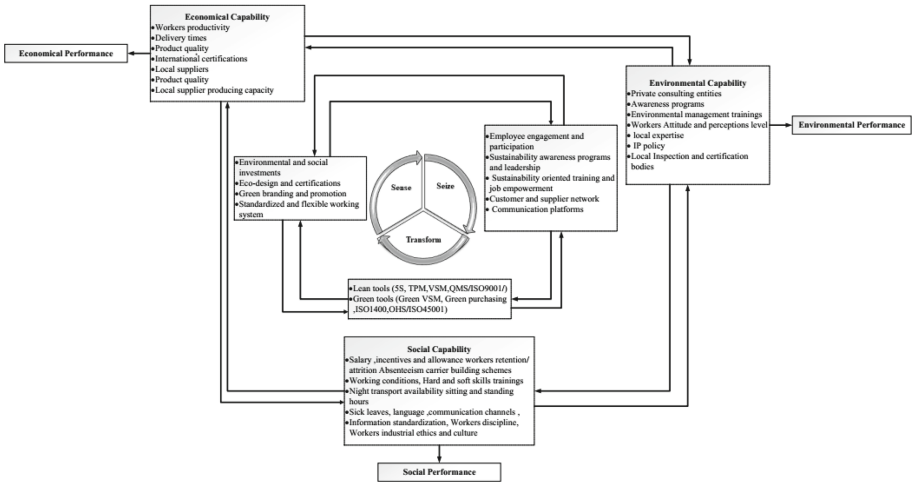

Fig. 5. Integrated sustainability measures and practices in dynamic capability process for EIP: a conceptual model

6 Conclusion and Recommendations

As a latecomer to industrialization, Ethiopia is now pushing forward to leapfrog and integrate into the global value chain. Industrial parks have been selected as the best policy options leading to sustainable development. The development process of industrial parks in different regions of the country is in a rapid process. Though the development speed is in progress, the operation management process is still at the initial stage and needs a lot of support for the sustainable performance of the parks. For this to happen, the literature suggests that incorporating sustainability measures and practices has been taken as a core area in the industrial sustainability of firms. Therefore, learning from literature findings on sustainability measures and practices, this study paper outlined the key measures (Table 1) and practices (Table 2) of sustainability in social, economic, and environmental dimensions. Basing the identified measures, an empirical review was conducted from secondary reports and primary data gathering of Ethiopian industrial parks, resulting in social, economic, and environmental aspects (Fig. 2, 3 and 4). Using a cause and effect diagram, the existing situation is illustrated following the empirical review findings, a comprehensive and summarized sustainability capability variables drawn (Table 3). Taking the dynamic capability view theory as a methodological approach to integrate the identified sustainability measures and practices, a holistic conceptual model was developed (Fig. 5).

As a general recommendation, Ethiopian industrial parks operation should be framed as a system incorporating sustainability measures and practices. Incorporating sustainability variables ultimately allows for the operation to achieve sustainable development in all the triple bottom lines. For this to happen, the different actors and functional units involved should contribute to this goal. Moreover, the EIP management system should initiate programs that contribute to social, environmental, and economic awareness and knowledge within the stakeholders and employees.

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