

A Green Supply Chain Management Migration Model Based on Challenges Faced in Egypt

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Abstract— As the issue of sustainability became of a prime importance in the global market during the last few years, a growing number of research has addressed green supply chain management, its drivers, barriers and implementation frameworks. However there is a significant gap in research that examines the green supply chain issues in Africa and the Middle East. Therefore, this research focuses on identifying the barriers and challenges that face the Egyptian organizations during the implementation of green supply chain management in order to be the basis for a green supply chain management migration model. The model is designed upon overcoming the identified challenges to facilitate the adoption of green supply chains.

Keywords— Sustainability; Green Supply Chain Management; ISO 14001; Green Practices.

I. INTRODUCTION

'Green' is the buzzword in today's business world. Global warming, the scarcity of natural resources along many other phenomenon enforced governments and international bodies to play a more serious role towards the sustainability of the environment. Businesses in return found themselves on the spotlight to make radical changes in their practices in order to fit into the 'green' era. Consequently, Green Supply Chain Management (GSCM) emerged as a normal development to Supply Chain Management (SCM) since many of its processes have a significant impact on the environment in the form of CO₂ emissions, Particulate Matters (PMs – also called fine dust) and waste to name a few. GSCM, according to Ref. [60] is, "*Integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life.*"

GSCM triggered the interest of researchers to investigate the drivers and practices to implement GSCM [31][15][12][54][7][40]. They stated that the main drivers that are leading organizations to implement GSCM are the environmental regulations and legislations, the increasing consumers' awareness about green products, the

competitors' pressures, community groups and the media. Reference [54] identified that the common environmental practices related to GSCM are industrial ecology, industrial symbiosis, eco-design, life cycle analysis, product stewardship, extended producer responsibility, and environmental management systems (EMS). All these practices aim to eliminate and mitigate the environmental impacts of organization processes on the environment. In addition to these practices, the adoption of an environmental management system (EMS) such as ISO 14000 is a part of a wider effort to reduce the supply chain's environmental impacts. Companies that have implemented ISO 14001 need to identify environmental aspects and assess the related impact not only to their internal operations but also throughout their supply chains. Implementation of the EMS requires organizational structures, procedures, and a knowledge base to manage the company's direct environmental aspects. Such managerial capabilities can also be utilized to manage the indirect environmental aspects that are associated with the activities of the company's suppliers [45]. Reference [5] confirmed that organizations who are ISO 14001 certified are more active in green supply chain (GSC) activities than those who are not. Also, Reference [49] empirically showed that ISO 14001 certified companies in Asia have introduced green supply chain initiatives, being motivated mainly by economic considerations that lead to competitiveness.

GSCM has been applied in many countries in different sectors. According to ref.[15] Japan, US and China respectively gain the highest profitability from GSC in comparison with UK, India, Australia and Germany. In term of sectors, logistics, construction and automobile have the highest profitability from GSC application. Organizations in these different sectors enjoyed several benefits from greening their supply chain such as positive impact on financial performance, efficient use of resources, lowered costs, product differentiation, adopting to regulations, reducing risks and improved quality and products [13][15].

Despite the benefits gained from GSCM adoption, there is still a large number of organizations in different industries

which are reluctant to adopt GSCM due to many challenges that hinder its implementation. In research, a significant gap has been noted in studies that investigate the challenges and barriers of GSCM implementation in general [7]. Nevertheless, the gap also persists in GSCM research in the African and Middle East region.

Therefore, this study focuses on identifying the challenges that face the Egyptian organizations during the implementation of GSCM in order to be the basis for GSCM migration model that is designed upon overcoming the identified challenges to facilitate the adoption of GSC. This model is developed based on the migration strategy framework developed by ref[15]. This paper will start with reviewing the literature on GSCM with a particular emphasis on the barriers and challenges to GSC implementation in addition to the GSC migration model.

The research methodology, the data collection and analysis and finally the proposed model for implementation will then follow the literature.

II. LITERATURE REVIEW

Before reviewing the challenges and barriers of implementing GSC, it is first important to comprehensively define GSCM. According to ref [72], GSCM encompasses “..how companies are implementing environmental initiatives in different phases of the supply chain comprising (a) inbound logistics; (b) production or internal supply chain; (c) outbound logistics; and in some cases, (d) reverse logistics. This greening of the supply chain includes materials suppliers, service contractors, vendors, distributors, sales personnel, waste handlers, and end-users who work together in a coordinated manner to reduce and eliminate any environmentally adverse impact that their company activities might generate.” This definition in return shows that GSCM is concerned with all the processes within the chain from the suppliers until the final customer.

Research topics in GSCM mainly focused on defining the scope of GSC, the practices of GSC, the drivers that encourage the implementation of GSC and the barriers and challenges that hinder its implementation [15][34] [70] [7] [40]. For this study, the researchers focused on the literature that addressed the challenges and barriers of practicing GSCM. The reviewed literature included several empirical studies from both developed and developing nations such as China, Germany, Egypt, Turkey, Italy, South Korea, Kenya, Japan and Sweden to identify the drivers and barriers that face the implementation of GSC. The researchers reviewed 140 articles that appeared from the year 2000 to 2013 in international scientific journals available in electronic databases such as Elsevier’s Science Direct, Emerald Publishers, Springer, IEEE, Taylor and Francis, and Google Scholar.

A. The Barriers and Challenges of GSCM

The barriers and challenges for GSC implementation are many. Reference [54] identified in their book the top barriers of application of industrial ecology concept as a part of practicing GSC. They identified capital investment as the top barrier, followed by the lack of adequate information, lack of access to technical expertise, lack of trained personnel, current legislation, and company policies. Ref.

[59] found that most of the SMEs feel that adopting good environmental practice adds a financial cost to the business which could not be passed on to the customers, and thus presenting a significant barrier to implementation. Ref.[47] summarized that there are nine barriers for adopting green practices in SMEs such as resistance to change, fear of failure, lack of awareness on environmental legislations, environmental impact of the operations in an organization, financial barriers, human resource barriers, lack of new technologies, materials or lack of technical expertise. Reference [10] declared that time and financial resources are the greatest factors that limit the implementation of GSC. Reference [36] identified that the company’s size and the lack of information resources or expertise to deal with environmental issues, are two significant elements to practice GSC. He further emphasized that companies which are large in size and have greater resources are more willing to participate in GSC initiatives.

On a more sector specific level, ref.[56] studied the primary barriers to implement environmental responsibility in three frozen seafood processing companies in Thailand. He identified three main barriers: lack of a system perspective on seafood sustainability, absence of top management commitment and cultural diversity. Reference [69] investigated the barriers that hinder the SMEs in Malaysia from implementing GSC and they stated that the two main barriers were resources and technical barriers. Reference [37] described eleven barriers of GSCM implementation in the Indian automobile sector and used Interpretive Structural Modeling (ISM) to find contextual relationships among the various barriers. The eleven identified barriers were: (1) Poor quality of human resource (2) Inadequate pressure from various societies (3) Poor legislation (4) lack of direct incentives (5) financial constraints (6) Technical barriers (7) Lack of management commitment (8) Lack of employee commitment (9) resistance to change (10) poor environmental awareness (11) inappropriate approach to implementation. A similar study was also conducted by ref.[40] on the Indian auto components manufacturers and found that the dominant barrier to GSCM implementation was the suppliers. Reference [5] examined the multifaceted relationship between Japanese firms’ ISO 14001 certification and GSCM practices. The authors found that ISO 14001 promotes GSCM activities. On a similar line, the impact of ISO 14001 on the environmental performance was significant in the pulp and paper industry in Quebec. Therefore, the lack of knowledge of environmental management standards such as ISO 14001 could be considered as one of the barriers in the implementation of GSC.

In Pakistan, ref.[61] have identified various factors that either hinder or support the implementation of GSC in SMEs. They found that the lack of environmental awareness was the main factor specifically the benefits, which would outweigh the costs of the GSC implementation. In Turkey, ref.[3] concluded that the most common barrier was in the cost of making an investment or restructuring processes. They further added the lack of environmental awareness that requires a cultural change and therefore education in order for the green issue to become a top priority in people and companies’ lives. Other barriers also included non-deterrent

penal sanctions, the technology, and the R&D related to these new trends, which did not exist in emerging countries such as Turkey, China, and India.

Finally in Egypt, specifically in the food and beverage sector, ref.[24] identified that the lack of financial and information resources about the GSC adoption techniques, and lack of governmental support to be the main barrier to GSC implementation.

After reviewing the literature on the barriers to GSCM implementation, the researchers categorized the barriers into two categories: (1) Internal barriers, which are within the scope of the companies' control, and (2) external barriers that are outside the scope of the companies' control. Table I and II respectively present the internal and external barriers to GSCM implementation that were identified from the literature. The researchers examined those barriers through conducting semi-structured interviews with practitioners in different case studies.

B. The Green Supply Chain Migration Model

Numerous models have been found in the literature for the implementation and adoption of GSC such as in ref.[54] [49][73][70]. But for this study, the researchers will use Emmett and Sood GSC framework which divides the movement towards GSC into seven key areas: green planning, green procurement, green execution, carbon management, migration strategy/approach, performance evaluation and continual improvement. The migration strategy is one of the significant elements of the framework that recommends a practical roadmap to move the organization from having a traditional SC to GSC. The migration strategy comprises three waves whereas the duration of each wave is not less than eighteen months. Each wave includes three phases and each phase's duration takes no less than 6 months. Waves help the company to migrate various elements of the supply chain in a more controlled approach. Emmett and Sood propose that companies shall decide which processes or elements are to be parts of each wave, but they recommend that packaging; procurement and logistics should be considered for wave 1, production and marketing for wave 2 and the rest components are well covered in wave 3. Figure 1 shows the GSC migration model.

The researchers will use Emmett and Sood's model in proposing a GSC migration model that would take into consideration the barriers faced in the GSC adoption in different companies in Egypt. It is hoped that the proposed model would support the companies in implementing the GSC principles seamlessly as it incorporates the tools to respond to potential implementation barriers.

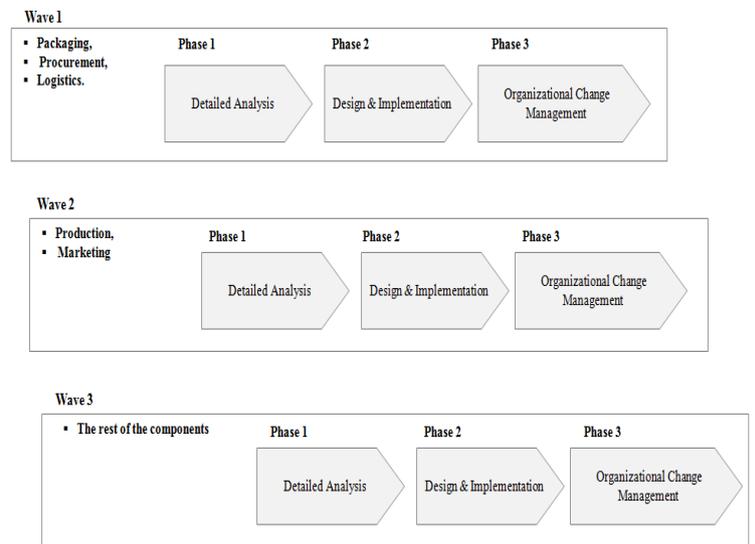


Fig. 1. GSC Migration Model

Source: ref[54]

III. RESEARCH METHODOLOGY

A multiple-case study research strategy was used to identify the common barriers and challenges of GSC adoption in Egypt. In particular, 7 case studies were conducted in different sectors: automotive, steel manufacturing, electrical and electronic, chemicals, food and beverages, shipping and tempered glass. The diversity of the selected case studies assisted the researchers in examining the common barriers and challenges across the different sectors that could support the generalizability of the proposed model. Semi-structured interviews were conducted with executives who are experienced in the field of GSCM or green logistics and who worked as managing directors, operations managers, logistics managers, supply chain manager, or environmental and safety managers. As recommended in multiple case empirical researches (Eisenhardt, 1989; Yin, 2003), the selection of the case studies were aimed at achieving both theoretical and factual replication in order to support the generalization of our results. The case studies were selected upon the following criteria:

- Small-medium size companies.
- Has extended experience in the adoption of GSC practice.
- Certified ISO 14001:2004 as environmental system.
- Involvement in environmental projects.
- Accessibility to the researchers.

TABLE I THE INTERNAL BARRIERS OF GSCM IMPLEMENTATION

		Barriers	Author
<i>Internal</i>	<i>Cost / Financial constraints</i>	High capital investment	[55] [40]
		Implementation costs	[67] [62]
		Financial constraints	[41][30] [59][50][63][27][46] [38] [40][10]
		Lack of financial resources	[34][24]
		Non-availability of bank loans to encourage green initiatives	[40]
		High cost for disposing hazardous wastes	[40]
	<i>Human Resource</i>	Lack of an economic justification	[75]
		Lack of access to technical expertise	[55][40] [47][25] [28] [45][51]
		Lack of trained personnel	[55]
		Poor quality of human resource	[38]
		Fear of failure	[49][47][23][52][40]
		Lack of human resources	[40] [47] [63] [28]
	<i>Commitment of interested parties</i>	Resistance to change and adoption	[38]
		Poor supplier commitment unwilling to exchange information	[67] [40]
		Lack of top management involvement in adopting GSCM	[14][4][20][57][66][36][23][65][63][28][41][73][50][31][25][75] [54][56][39][47]
		Lack of employee commitment	[39]
		Lack of legitimacy	[67]
		Perception of “out-of-responsibility” zone	[40] [1][58][28]
	<i>Awareness</i>	Poor environmental awareness	[38] [61] [3]
		Lack of awareness of potential advantages of GSC	[61][40] [34] [18] [9][74]19[63][52]
		Problem in maintaining the environmental awareness of suppliers	[40][53] [71] [43]
		Lack of awareness about reverse logistics adoption	[40] [50]
		Lack of training courses	[40]
	<i>Technical</i>	Technology and the R&D	[3][47]
		Complex in design to reuse or recycle the product	[40]
		Lack of new technology, materials and processes	[40][75]
		Infrastructure development	[40][40]
	<i>Management System</i>	Company policies	[55][63][51][13][2]
		Lack of adequate information about implementation.	[55]
		Inappropriate approach to implementation	[38]
		Time to adopt GSC	[34][10]
		Complex to measure and monitor the practices of suppliers	[45][16][43] [40]
Lack of effective environmental measures		[40][49]	
Lack of management skills and environmental knowledge		[40][58][28][6][64][60]	
Lack of Corporate Social Responsibility		[57][26][43][40]	
Lack of Inter-departments cooperation in communication	[29] [64][52][11] [50] [40]		

TABLE II THE EXTERNAL BARRIERS OF GSCM IMPLEMENTATION

		Barrier	Author
<i>External</i>	<i>Legislation</i>	Poor legislation & regulation	[55][67][38][3]
		Non-deterrent penal sanctions	[3]
		Industry specific	[67]
		Integration of environmental concerns in economic and social development	[40]
	<i>Commitment of interested parties</i>	Poor supplier commitment	[22] [54] [17]
		Lack of customer awareness and pressure about GSCM	[8][33][46]
		Lack of government support to adopt green policies	[40][48][21][2]
		Inadequate pressure from various societies	[38]
		Cultural diversity	[56]
	<i>Resources</i>	Lack of professional training programs	[40]
		Lack of consultancy institutions to train and monitor the progress specific to each industry	[40]
		Conservation of critical environmental resources.	[7]
		Efficiency in environmental resource use	[7]
		Non-availability of clean fuel	[7]
		Lack of direct incentives	[38]

In addition to the case studies, the researchers also conducted a series of semi-structured interviews with 5 senior consultants in the field of quality and environmental systems and who are highly involved in the implementation of ISO 14001 in different business sectors in Egypt. The semi-structured interviews were conducted face to face and each interview

lasted between 30 and 45 minutes. The semi-structured interviews were divided into three main sections. The first section examines the extent of GSC implementation within the interviewed companies, the second section investigates the internal and external barriers faced during GSC

implementation, and the third section examines the proposed actions to overcome the barriers.

IV. RESULTS

A. The Extent of GSC Implementation

Most of the interviewed companies have been practicing different GSC activities for an average of three years, with ‘green production’ being the most practiced green activity. The automotive and the electronics manufacturers were the only companies that nearly apply the full spectrum of green activities (inbound and outbound logistics, green procurement, green product design, green production, green packaging and reverse logistics). These two companies have very serious green policies and regulations because they are part of well-known multinational companies who promote sustainability as a company mission. The interviewees were then asked to determine which activity they started with in their green initiative and the most common activities were ‘green product design’ and ‘green production’. According to one of the interviewees, most companies tend to focus on greening the production process as a start in their green initiatives because in most industries, production has the most substantial impact on the environment. But he also noted that starting with greening the production process is very challenging and takes a significant amount of time due to the complexities involved. As to the drivers or pressures that forced the companies in adopting GSC processes, all the interviewees stated that ‘laws and legislation compliance’ was the main driver, followed by the stakeholders’ pressures. These results in line with ref[31,15,12,54,7,40]. The interviewees were also asked to state the benefits that their companies gained from implementing GSCM. Nearly all the interviewees stated that ‘good reputation’ was the main benefit, followed by the ‘minimizing energy use’ and the ‘efficient use of resources’.

B. The Barriers of Implementing GSCM

In this section, the interviewees were asked to select the internal and external barriers/challenges - previously described in Table I and II - which their companies faced during the implementation of GSCM. Internal barriers were categorized into six groups: financial constraints, human resources, commitment of interested parties, technical, awareness, and management system. In the financial constraints category, ‘high capital investment’ was the most common barrier for all the interviewees that similar to ref [24] results. This was justified by the fact that the majority of companies start their green initiative with greening the production process which requires high capital investment. In the human resource category, ‘lack of trained personnel’ and ‘resistance to change and adoption’ were the two most common barriers. The interviewees indicated that these two barriers are the most challenging when compared with the other barriers, because without people’s belief in the importance of sustainability, achieving a GSC would be a very difficult mission. These

barriers identified earlier by ref [47,37] In the commitment of interested parties’ category, ‘poor supplier commitment unwilling to exchange information’ was the most stated barrier. This poor commitment of suppliers is also justified by the lack of awareness, knowledge, and economic justification of adopting GSC practices. In the technical category, the majority of the interviewees indicated that there was no significant barrier in this category, with the exception of two interviewees from the food and beverage sector and the tempered glass sector who stated that the most faced barrier in this category was ‘the lack of new technology, materials and processes’. They indicated that they did not find in Egypt a reliable source or a specialized consulting firm that can provide their companies with the know-how of greening their processes. Consequently, they hired foreign consultants, which had a considerable impact on their budget for the project. In the awareness category, the most recurring barrier was ‘the lack of awareness of potential advantages of GSC’ and in the management system category, the most stated barriers were ‘lack of adequate knowledge about implementation’, ‘lack of management skills and environmental knowledge’ and the ‘lack of inter-departments cooperation in communication’. These results are similar to ref [61,40,34,18,9,74,19,63,52] results that stated in literature. As for the external barriers, the interviewees stated the barriers they faced in four category: legislation, commitment of interested parties, cost, and resources. The interviewees stated that they did not face any barriers in the legislation category because their companies’ green regulations are far stricter than those described in the Egyptian environmental law. As to the commitment of interested parties, ‘cultural diversity’ was the most common. Finally, in the resources category, ‘the unavailability of clean fuel’ and ‘lack of direct incentives’ were the most faced barriers in this category. Table III summarize the common and highly frequent barrier in each category based on the interviews findings. The findings show seven of eleven barriers concern with lack of awareness, educational and knowledge about environmental practices, resistance to change and cultural diversity.

Table III The common and highly frequent barrier in each category based on the interviews findings.

Category		Barriers
Internal	Cost / Financial constraints	High capital investment
	Human Resources	Lack of trained personnel
		Resistance to change
	Commitment of interested parties	Poor supplier commitment
	Awareness	the lack of awareness of potential advantages of GSC
Management system	lack of adequate knowledge about implementation	
	lack of management skills and environmental knowledge	
	lack of inter-departments cooperation in communication	
External	Commitment of interested parties	Cultural diversity
	Resources	The unavailability of clean fuel
		lack of direct incentives

C. Proposed Actions to Overcome Barriers

The last section of the interviews focused on getting the interviewees opinions on the proposed actions for overcoming the challenges faced during the implementation of GSC. The interviewees proposed the following: (1) Top management support and direct engagement in the green initiative (2) Establishing a dedicated department for planning and monitoring the implementation of the green processes (3) Changing the organization’s culture and perception towards sustainability to gain everyone’s commitment.

V. DISCUSSION

The implementation of GSCM is not a simple mission. As it was shown from the literature and the data collected, the process of implementation is usually faced with barriers that renders the implementation process challenging. As previously stated, the aim of this study is to propose a GSC migration model that would encompass the most common barriers that companies face in Egypt in order to facilitate the GSC implementation process. And based on the identified barriers from the interviews as shown in table III, it could be safely claimed that the root cause for the majority, if not all the barriers is in education. Providing the right education about sustainability and GSC to the companies’ employees and stakeholders would raise their knowledge, awareness and their commitment in the implementation process. This would consequently support the companies in reducing the resistance to change which, as indicated by one of the interviewees, is one of the most challenging barriers. Therefore, the researchers propose a GSC migration model for Egyptian companies based on the framework of Emmett and Sood (2010). In the proposed model, an additional wave would be added to the framework, to be called wave zero. In this preparatory wave, the company would conduct a detailed analysis on the educational needs of its employees and stakeholders to determine the areas of development within the scope of sustainability. Consequently, a detailed training plan is designed to deliver the required knowledge for a period no less than 12 months. Then wave 1 could be started with greening packaging, procurement, and logistics. It is worth noting that it is not recommended to start the greening process with production, because it involves high capital investment and very sophisticated processes, which might discourage companies in executing their green initiatives. Figure 2 presents the proposed GSC migration model for Egyptian companies.

VI. CONCLUSION

Organizations appear to have many barriers to implement GSCM. The literature review revealed a growing number of research that investigates GSCM in general, and more specifically the drivers, barriers and implementation frameworks. The literature also revealed an apparent lack of research in GSCM that focus on developing countries, especially in Africa and the Middle East. And with the

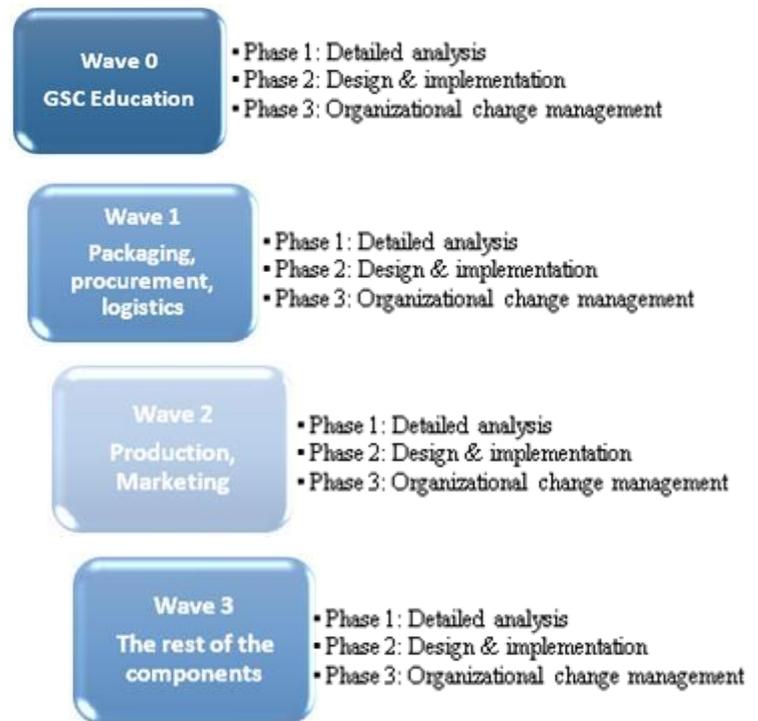


Fig. 2. The Proposed GSC Migration Model for Egyptian Companies

growing interest and attention of the global market about sustainability, it was necessary to investigate the barriers of GSCM implementation in Egyptian companies and provide a GSC migration model that would support the seamless implementation of the green principles.

In this study, the researchers found a number of barriers that were common across organizations in different sectors and the researchers found that the root cause of the identified barriers was education. Therefore, the proposed model included an essential step that would require equipping the organizations’ employees and stakeholders with the needed GSC knowledge through educational programs.

Further research is recommended to propose the key knowledge areas that are required for the implementation of GSC, as well as the proposed teaching methods that would guarantee the sustainability of knowledge and the growth of the employees’ competencies.

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