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KNOWLEDGE TRANSFER: THE CASE OF GRUPO SUEZ Y AGUAS DE CARTAGENA S.A. E.S.P. "ACUACAR"

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Abstract. The article describes the results of the knowledge transfer of the Grupo Suez, based on improvement solutions to eliminate or mitigate conflictive or problematic situations, risks or opportunities in the strategic processes and indicators of Aguas de Cartagena S.A. E.S.P. - Acuacar, but in turn reviews the state of the art in connection with the transfer of corporate discernment in the last 10 years, which allows the hypothesis to be configured: knowledge transfer improves corporate performance. The analysis was carried out from a qualitative quantitative approach based on the documentary analysis and the positivist paradigm. ACUACAR's own knowledge delivery registration methodology was also revised, so that its synthesis could be constructed in the 2019 period, as was the variance analysis technique to demonstrate the assumption indicated. The exploratory, descriptive and longitudinal ad hoc design was based on document review, observation, application of data collection instruments and interviews with the management team of Aguas de Cartagena S.A. It was found that the knowledge transmitted through methods, procedures and technologies exerts a positive influence on the corporate performance of ACUACAR. In conclusion, the thesis is confirmed that the knowledge transfer has a decisive influence on the improvement of the business performance of ACUACAR.

Keywords: knowledge transfer, organizational performance

TRANSFERENCIA DE CONOCIMIENTO: EL CASO DEL GRUPO SUEZ Y AGUAS DE CARTAGENA S.A. E.S.P. "ACUACAR"

Resumen. El articulo describe los resultados de la transferencia de conocimiento del Grupo Suez, a partir de las soluciones de mejoramiento para eliminar o mitigar las situaciones conflictivas o problemáticas, los riesgos u oportunidades en los procesos e indicadores estratégicos de Aguas de Cartagena S.A. E.S.P. – Acuacar, pero a su vez revisa el estado del arte en conexión a la cesión del discernimiento corporativo en los últimos 10 años, lo que permite configurar la hipótesis: la transferencia de conocimiento mejora el rendimiento corporativo. Él análisis se realizó desde un enfoque cualicuantitativo sustentado en el análisis documental y el paradigma positivista. Se revisó también la metodología propia de registro de entrega del conocimiento de ACUACAR

con lo que se pudo construir su síntesis en el periodo 2019 al igual que se utilizó la técnica de análisis de la varianza para demostrar el supuesto señalado. El diseño exploratorio, descriptivo y longitudinal *ad hoc* se fundamentó en la revisión documental, la observación, la aplicación de instrumentos de recogida de datos y entrevistas al equipo directivo de Aguas de Cartagena S.A. Se encontró que el conocimiento transmitido a través de métodos, procedimientos y tecnologías ejerce influencia positiva en el rendimiento corporativo de ACUACAR. En conclusión, se corrobora la tesis sobre que la cesión de conocimientos despliega influencia determinante en la mejora del rendimiento empresarial de ACUACAR.

Palabras clave: transferencia de conocimiento, rendimiento organizacional

Introduction

According to Ofek and Sarvary (2001) knowledge and its management can be divided into two areas: knowledge creation and knowledge transfer. The first is limited to exploration (generation of new ideas, concepts, product and service innovation), in other words, its genesis is based on existing knowledge, be it tacit (Nonaka and Takeuchi, 1995) or explicit (Kogut and Zander, 1992; Nahapiet and Ghoshal, 1999). For its part, the knowledge transfer makes it possible in an alternative way, both the exploitation and the application of existing business judgment. In the corporate framework, there are different types of knowledge classified between individual and group. Provided it is prototyping, developing goods and services, software packages and technology, an organization must take advantage of these truths, many of them because of organizational or dynamic capacities to achieve what Grant (1996) calls "knowledge integration."

In fact, the effective integration of the knowledge of a firm's collaborators leads to the improvement of unique and idiosyncratic capabilities (dynamic capabilities) that would enable it to have long-term competitive superiority. Grant (1996) then proposed that the combination and unification of organizational truth be analyzed as its main asset. In a categorical way it maintains, in line with the above, that its integration occurs when it occurs in one context, situation or location and is applied in another. It is so true how limited that today more and more business ecosystems are related to the transfer of technology and knowledge in different corporate sectors. From the academy, research centers, technology parks or the organizations that manage and transmit the knowledge, all without exception intercede, in the transformation of business truth, in economic returns through the market or the self-production of knowledge. This, in essence, supports the domain of knowledge transfer.

Under the foregoing considerations, it is therefore unavoidable to present a practical case that defends the aforementioned positions without prejudice to the review of the state of the art of business phenomenologies at the global and local level. As such, the article examines from a mixed perspective (theoretical and empirical) the role and importance of a business group like Suez, capable of producing and managing knowledge in its global operating environments to transfer and integrate it into a Colombian company called Aguas de Cartagena S.A. E.S.P "Acuacar," which manages the aqueduct and sewerage of said city. Thus, here you can find an analysis, from Suez's vision as Acuacar's operating partner, of the advantages of delivering and receiving knowledgeable methods and procedures, as well as technological developments that have improved strategic and operational performance from the last company.

In this way, it is evident how knowledge management and technology transfer from external sources and internal learning of the organization help its innovation and competitiveness (corporate performance). This interaction, unification and transfer between new knowledge, technological developments and the appropriability of discernment must be continuous over time to generate positive changes in the value added chain, both from knowledge providers and from the local company itself.

In addition, thanks to the fact that it is a composite paradigm document related to the knowledge transfer, including technology, it could be a material of great help for students, entrepreneurs and knowledgeable collaborators in the field who need to appropriate and remember concepts and renew their reflections. However, it can also become a preamble for the general public, so that they approach the concepts most used today in the knowledge transfer. With all of the above, it is expected that this document will be a guideline and serve as a reference in the international, national and local contexts, and at the same time it will be very useful both for the training of new technological and cognitive skills for Acuacar and external professionals to the corporation, as well as for academic and practical reflection associated with the transmission of knowledge.

Theoretical foundation

Knowledge transfer has had different definitions. Nelson and Winter (1982) state that the transmission of knowledge is limited to the delivery of best practices or routines (they must generate sustainable competitive advantages) that an organization performs in a superior way to another dependency of this or another company. In the same orientation, Albino, Garavelli and Schiuma (1999), consider the knowledge transfer as the process by which insight is transmitted, learned and apprehended by a company or productive units. Similarly, the knowledge transfer is required as the procedure by which its recipients obtain it from the transferors on the condition that they can accumulate, mold and modernize their production capacity (Liao and Hu, 2007).

Following the line of basic conceptualizations, researchers such as Argote and Ingram (2000) and Inkpen and Tsang (2005) argue that the knowledge transfer depends on the interaction of at least two instances, be these people or organizations, as well as that of said exchange of practices, knowledge or lessons learned benefits one or more firms based on the experience of the transferors. However, they left aside the learning factor, which for Darr and Kurtzberg (2000), Foss and Pedersen (2002) and Gray and Meister (2004) is essential in order for the host company to apply the knowledge acquired in the form of solutions to their problem situations.

In a complementary way, Gupta and Govindarajan (2000), Nissen (2006) and Renzl (2008) comprise the concept or act of knowledge transfer. Without prejudice to the interaction and learning indicated, the construct for them involves changes, movements and applications of knowledge over time. This is why they insist that the flow of knowledge (bidirectional sense) between the parts, scales components such as conversion, transmission, exchange, integration, reuse and appropriability, but at the same time it must rest on an anthropomorphic system that holds the capacity for change and conscientious, indivisible and responsible behavior, as well as a group culture that supports it.

Under the previous discussions, knowledge transfer is conceived by authors such as

Kumar and Ganesh (2009), Liyanage, Elhag, Ballal and Li (2009) and Zhou, Siu and Wang (2010) as a routine of exchange of explicit or tacit knowledge between two or more agents (companies, productive units, departments or people), in which one receives, implements and adapts the knowledge provided by another to their particular situations or contexts, usually in the midst of conflictive scenarios or problematic environments. Said procedure necessarily involves two complementary acts: providing or receiving knowledge, or receiving and using knowledge (implies learning), which is presented in Figure 1.

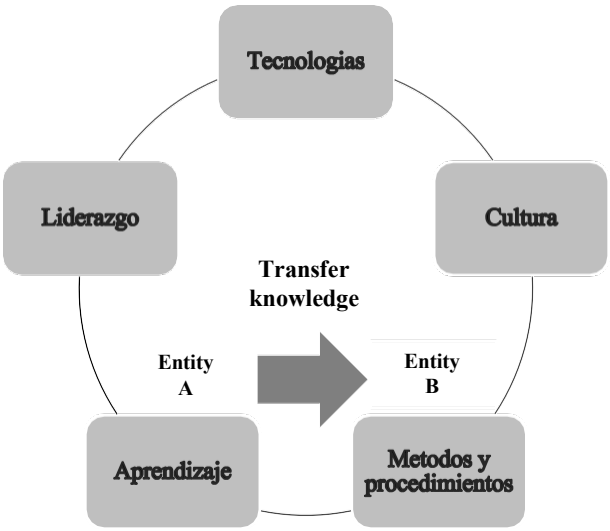

Figure 1. Knowledge transfer

Note: Taken from Kumar and Ganesh (2009), Liyanage, Elhag, Ballal and Li (2009) y Zhou, Siu and Wang (2010).

Further on, Sáenz, Aramburu and Blanco (2012) explain that the organizational culture based on the knowledge transfer entrusts the presence of trust based on moral and ethical principles, such as: collective beliefs, consonances of thought, pedagogical knowledge transfer and in the learning dialogues. Blanco-Valbuena and Bernal (2018) and Matsuo (2015) agree that knowledge transfer generates core competencies capable of creating new knowledge in business development; the outsourcing of tacit knowledge based on training, as well as on human resource development programs sponsored through communities of practice, increase the continuous productivity of companies.

It is also appropriate to analyze the vision that Prats (2019, p.107) exposes on the construct. The author maintains that both information and communication technologies (ICT) and knowledge management enrich the innovation of the company. Similarly, Chiapa-Zenón (2019, p.54) defends the paradigm of the benefits that technology transfer brings, at least with regard to the productivity and innovation of companies, also consenting to their economic returns in terms of transaction cost and market failures, given that not all firms would be in favor of the management and then the cession of the discernment, but would wait for the leading and strong market corporations to investigate and implement the improvement actions and then, through imitation strategies, replicating knowledge or simply hiring technical assistance (e.g., expiration of patents or technology transfer cooperation contracts).

The investigation of the authors who endorse the direction of the truth addressed in reciprocity to the points of view of Tautiva-Merchán (2019, p.91), who argues that

knowledge, technology, methods are transferred in collaborative workspaces will be expanded and procedures perfected by other entities, subsequently adapting them to the ecosystem and cultural contexts of each recipient company. However, Medellín and Arellano (2019, p.14), without going around the bush, disagree with the above; it is then a complex and difficult activity to implement business. They add that in the knowledge transfer, specifically in the technological field, it is common to find difficulties classified into four areas: a) Lack of information, b) Little knowledge of valuation methods, c) Level of technology development, and d) Practice technology acquisition business.

For his part, García-Lirios (2019, p.1) establishes that the knowledge transfer symbolizes the degree of learning of the parties, and that its effectiveness is measured with the results of the management, production and knowledge transfer based on tasks, rather than the objectives or goals of collaborative networks. They then propose the term of organizational self-intelligence based on four components: self-regulation, dissipation, adaptability and cognitive dynamism. It coincides with Blanco-Valbuena and Pineda (2019) in that the transfer of the unionized truth depends on the continuous experimentation and the intelligent cooperation-collaboration of their work groups. So much so that with a clear advocacy orientation of the conception of intelligent self-knowledge, they ensure that intra-learning will be effective.

Here it is convenient to stop for a moment to highlight the work of Díaz-Catalán, López-Navarro, Rey Rocha and Cabrera Álvarez (2019), who without prejudice to the fact that the knowledge transfer includes the transfer of relevant information in terms of science, methods, technology and procedures, it also involves motivation and reputational merit. However, on the other hand, they advocate rewards mainly based on the number of disclosures in international indexed journals with a high impact factor, which can ruin activities prone or related to transfer. In short, it intimates a dual system of interactive and frequent learning, as well as the formalization of awards for achievements.

Under the same discourse, Castelló-Mayo, López-Gómez and Méndez-Fernández (2019) add that the transfer of organizational truth demands a technological and cultural platform that facilitates the convergence and integration of the contents and products learned and apprehended from their collaborators, either from those who deliver or receive relevant information. In fact, they focus their interest on the correlation and combination of data under an information network protected by a constant renewal of professional rules and routines, both at the level of production and dissemination of content, because all this together represents the success of the intra-company knowledge transfer.

In the same sense, Terán-Bustamante and Mendieta-Jiménez (2019) argue in subordination of the transmission of corporate discernment, which cultural patterns are required established in frequent and effective interactions between their participants through, for example, networks, forums and communities of practice. In the same way, Marulanda, Valencia and Marín (2019, p.45) add that knowledge transfer involves, apart from having factors such as communication, learning, trust and the interaction of individuals, a solid organizational culture and, consequently, they argue that knowledge transfer requires a collective consciousness among its participants. In this regard, they assure that the firm and its members need a high cultural convergence.

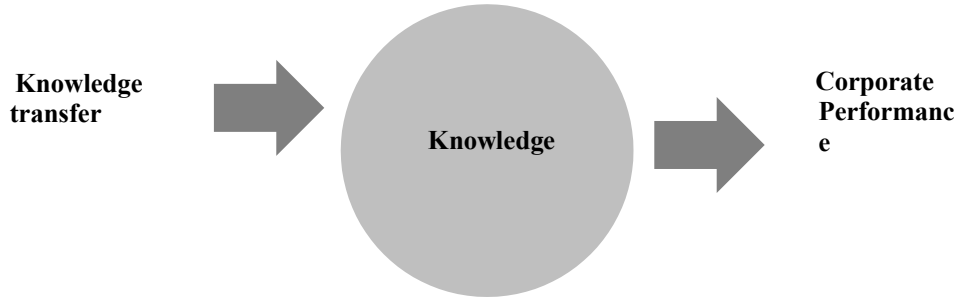

Figure 2. Relationship of variables

Note: Taken from Corsino et al., (2019), Mendoza-Betin (2018b; 2019), and Steensma, Chari and Heidl (2015).

It is now the turn of corporate performance, which will be analyzed conceptually under the variable: process improvement, which Caro-Paz and González-Gómez (2015) define as: activities that add value to products or processes, accordingly graph with Figure 2.

Once a rough review of the literature around knowledge transfer and business performance has been carried out, the theoretical relationship of the constructs is evident, and in its support the hypothesis that guided this research springs up, which is mentioned below: Knowledge transfer improves corporate performance. Therefore, it is reasonably inferred that it is convenient and pertinent to study, based on a practical exercise, the aforementioned phenomenon, since apart from being hypothetically detailed there is also no study of this characteristic in the economic context of the city of Cartagena, Colombia. De facto, this document constitutes the first analysis of the effect of the knowledge transfer of the Grupo Suez in Aguas de Cartagena S.A. E.S.P. "Aquacar."

Method

The article was carried out from a mixed paradigm (mixture of qualitative and quantitative), with an especially qualitative and quantitative methodology of a descriptive, documentary, exploratory type and a non-experimental, longitudinal and field design in reference to the year 2019. The worked variables (transfer knowledge and corporate performance) were initially analyzed by the leaders of the strategic and tactical units of Aguas de Cartagena S.A. E.S.P. based on the registry of the solutions suggested by the operating partner: Grupo Suez, to the problematic or conflictive situations raised by ACUACAR, as well as other actions suggested by the former in the period indicated, which will be detailed in the results (Tables 1 and 2).

Finally, without this meaning that it is not important, the contrast of the aforementioned factors was undertaken based on the calculation and evaluation of the effects of knowledge transfer on corporate performance, supported in a multivariate causal relationship scheme, specifically the factor of the analysis of variance (ANOVA), which was deduced when having access to the ecosystem records, which allowed the construction of an ad hoc data collection instrument. In synopsis, according to the literature review, the connection and effect between the variables was studied in the international context, but not in the city of Cartagena (Colombia). Given the knowledge gap, the following hypothesis was

proposed:

Hypothesis H1: Knowledge transfer improves corporate performance.

The non-probabilistic sample included 43 analysis units, all collaborators of the management team, who participated in the knowledge transfer registry, which began on January 1 and ended on December 31, 2019.

Techniques and instruments

In order to collect the information, it was necessary to identify the data collection sources and then define the following techniques and tools: (1) documentary analysis: access to three documents called: Registration manual of knowledge transfer from the Grupo Suez to Aguas of Cartagena S.A. E.S.P., to the structured knowledge transfer record format and to the strategic management indicators. The second is a tool to collect the aforementioned contents (see annex 1); (2) annotations resulting from non-participant direct observation: a written record was made of what was seen and heard in the context and the cases or participants in accordance with what Hernández, Fernández and Baptista (2010, p. 377) propose; and (3) analysis of management indicators; as a result of some conversations, the observations of the management team and comments delivered by them, some management indicators were compared. The ad hoc instrument was subjected to a double validation process: (1) through the judgment of three experts, and (2) through a pilot test in which an intentional sample of four directors of ACUACAR participated.

Procedure

To understand the documents and data, initially a compilation of secondary sources was carried out, mainly the knowledge transfer registration formats and strategic indicators supplied by members of the management team. Once the information was collected, a summary record was constructed with some of the most relevant examples of the knowledge transfer from Suez to Aguas de Cartagena in the 2019 period. Then the primary information was collected through some indicators and specific records of the transfer, which was taken to the *ad hoc* tool (annex 2), in such a way that once the primary numerical data had been collected, the results collected were tabulated based on annex 2, with which it was possible to perform the statistical contrast.

Results

Below, Tables 1 and 2 show the 54 most representative records of the knowledge transfer of the Grupo Suez to Aguas de Cartagena S.A. E.S.P. in the 2019 period, which have been sidelined as follows: (a) design and/or improvement of work methods, and (b) convergence between technology transfer and work methods.

Table 1

Most representative examples of knowledge transfer for the design and/or improvement of work methods (year 2019)

No.	Management	Problematic situation	Implemented solution
1	Technical	Technical shutdowns, which directly affected the supply of raw water to the Treatment Plant (DWTP El Bosque), causing service interruptions.	Reliability improvement plan at the Albornoz raw water station, based on subsystems. It consisted of dividing it into three subsystems, allowing flexibility in the operation and also allowing the maintenance of all equipment to be carried out without taking the station out of service.
2	Financial	Update of financial management only from Colombian jurisprudence and regulations.	Financial management based on international standards.
3	Financial	Update of financial audit management only from Colombian jurisprudence and regulations.	Financial audit based on international standards.
4	Financial	Update of accounting management only from Colombian jurisprudence and regulations.	Accounting analysis and management based on international standards.
5	Corporate and organizational development	Update of activities only for training and skills development.	Training and development of human talent skills.
6	Corporate and organizational development	Update of Human Resources Management activities only in aspects such as selection and hiring of collaborators.	Comprehensive management of human talent.

No.	Management	Problematic situation	Implemented solution
7	Corporate and organizational development	Update of Contractor Management activities only from the price area	Updated world order policies in contractor management
8	Corporate and organizational development	Update of Communications activities only from the user's scope	Updated policies of the world order in social management
9	Corporate and organizational development	Little participation of the employees of Aguas de Cartagena S.A. in solving problems associated with processes	Aguas de Cartagena Plan for Excellence
10	Corporate and organizational development	Little participation of service providers' collaborators in solving problems associated with processes	Service Provider Plan for Excellence
11	Communications and public relations	Update of communication activities only from the user's scope	Updated communication policies that integrate all stakeholders
12	Occupational safety and health	Increase in the frequency and severity rates of occupational accidents	"Fair Culture: I take care of myself, I report, I prevent" program
13	Occupational safety and health	The decrease in the involvement and commitment of the employees of Aguas de Cartagena S.A. around health and safety practices at work.	Implementation of the basic rules that save lives Program as a cultural path to prevent risks of this nature.
14	Internal control	Update of Internal Control activities only from Colombian jurisprudence and regulations.	Strengthening of the internal audit department based on international standards.
15	Legal	The risks may alter the economic balance of the contract when the reciprocity between the parties in terms of their benefits is broken, since this generates higher costs for some of them.	Legal prevention in the creation of habits and customs that allow the development of personal and business activities in a controlled environment, where most of the risks have been considered within contractual management.

Note: Taken from own measurements assessed in Excel (2020)

Table 2

Most representative examples of the convergence between technology transfer and work methods (year 2019)

No.	Management	Problematic situation	Implemented solution
1	Technical	Generation of sludge product of sedimentation, filter washing and coagulant residues that are taken to a sedimentation pond, where they are decanted and then the clarified supernatant liquid is recirculated at the head of the Treatment Plant.	Sludge treatment system of the El Bosque DWTP.
2	Technical	The production flow of the water treatment plant was close to the limit required to supply the entire population of Cartagena.	Improvement in the treatment, operation and maintenance processes of the El Bosque DWTP.
3	Technical	In the drinking water treatment process of the city of Cartagena, the consumption of coagulant was above the average used in some plants with similar characteristics.	Optimization of chemical inputs in drinking water treatment using the CHEMBoard method.
4	Technical	The disinfection process due to direct contact with chlorine (l) generated a high-risk situation for the water treatment plant and the community that is around it. Chlorine (l), being a highly reactive product, can generate by-products, it is also explosive and flammable with the presence of Hydrogen and/or other elements.	Substitution of chlorine gas by mixed oxidants in the drinking water treatment disinfection process (MIOX).

No.	Management	Problematic situation	Implemented solution
5	Technical	In the processes of collection, treatment, distribution and treatment of drinking and wastewater in the city of Cartagena, energy consumption was above the average used in some plants with similar characteristics.	Implementation of the technological energy management system of Aguas de Cartagena S.A. E.S.P. (Energy efficiency).
6	Technical	Seawater with sand is being collected and transported through the sanitary sewer networks, which is affecting the useful life of the submersible pumps, ductile cast iron piping system and increasing energy consumption due to the additional water flow that is arrives at the station.	Control of seawater infiltration in sewer collectors (Salinity), repair with mortar the damaged structures and application of waterproofing products.
7	Technical	The operation of the sewer maintenance process was carried out in a semi-automated manner.	Methodology for planning the preventive maintenance plan and monitoring of the sewage network through closed-circuit television technology.
8	Technical	In the built sewer collectors with concrete pipes, structural damage could occur in their walls due to the presence of H2S gases generated by wastewater.	Slip lining implementation for the rehabilitation of trenchless sewer collectors, which consists of placing a smaller diameter pipe in the host collector, allowing the sewer system to continue to operate in parallel.
9	Technical	The operation of the Aqueduct and Sewerage processes was carried out in a semi-automated manner.	Automation and remote control systems (Remote communication of equipment and infrastructure).
10	Project and Loss Control	Reduce the loss indices of Unregistered Water in order to improve the performance of each of its hydraulic sectors in Cartagena.	Analysis of sectors by hydraulic performance for technical and commercial actions based on the statistical package and data analysis called Aquacircle.
11	Project and Loss Control	On average, 1,484 damages to the network and 9,757 damages to connections occur annually. On the other hand, for the control of pressures in the network, there are pressure sensors installed in the different sectors. For the monitoring and control of the distribution infrastructure, in the Scada system and other applications of the existing instrumentation, there are more than 180 flow signals and 220 pressure signals, but all this was disintegrated.	Comprehensive technological tool for the management and hydraulic operation of the network, capable of performing statistical data analysis called: Aquadvanced.
12	Project and Loss Control	Among the hydraulic sectors identified with the highest frequency of damage are: Blas de Lezo 2nd Stage, Socorro1 and La central, for which it was defined to implement in these sectors a pilot for monitoring and analyzing the behavior of pressures in the networks, which would allow better management and operation focused on reducing failure rates, and therefore optimizing the use of resources.	Pilot project for the management of pressures in the network, capable of performing statistical analysis of data called: Inflowmatix
13	Project and Loss Control	The need to exchange knowledge and lessons learned between the different companies of the Grupo Suez, in order to improve efficiency in water distribution, taking into account the experiences of other companies in the sector.	Participation in TecRex - Suez Technical Distribution Committee
14	Project and Loss Control	Exchange of knowledge, practices and lessons learned between Grupo Suez companies.	Business exchange between Aguas de Saltillo S.A. de CV (AGSAL) and Aguas de Cartagena S.A. E.S.P. (Acuacar)

No.	Management	Problematic situation	Implemented solution
15	Information and Communication Technologies	The operation of all the management related to the energy equipment and infrastructure is carried out manually, generating possible human errors that affect the quality of the data.	Energy Efficiency System to ensure the effectiveness of the management with the Enerlogy Monitoring software (EMO), which is a WEB application to control consumption and specific parameters, having detailed information and the possibility of interpreting it in such a way that allows energy efficiency improvements to be carried out with objective criteria or the monitoring of improvements already made.
16	Information and Communication Technologies	The commercial processes of Aguas de Cartagena S.A. were carried by the commercial information system AS 400; due to the obsolescence of this application and the different interventions to which it was subjected during its use, it presented restrictions and generated inconsistencies in some of its operations.	AquaCIS CF, includes AquaCIS CF, OM Java and a universal biller Karat - Fragest.
17	Information and Communication Technologies	The commercial processes of Aguas de Cartagena S.A. they were carried by the commercial information system AS 400; Due to the obsolescence of this application and the different interventions to which it was subjected during its use, it presented restrictions and generated inconsistencies in some of its operations	Dinapsis Control Data Center, which meets the expectations, requirements and needs, covers the management needs in real time, a common environment, a centralized, secure hardware system, with a guarantee of cybersecurity, business continuity, critical infrastructure protection, based on the latest standards for the development, design, installation and management of remote control systems for industrial processes and flexibility in their implementation.
18	Information and Communication Technologies	Data analysis based on descriptive statistics.	Artificial Intelligence (AI), which fulfills the computing purpose of carrying out predictive modeling based on statistics such as linear regressions or neural networks.
19	Information and Communication Technologies	The Aguas de Cartagena database was based on a version of GISAgua prior to 2012, which was improved based on the guidelines and recommendations provided by the operating partner to accommodate new data, but it was necessary to update the current platform and data model modernization.	Portal Gisagua ArGIS; an architecture and data model of the operating partner based on the ArcGIS platform, which is what Aguas de Cartagena had, but with outdated and lag in the organization and data analysis model.
20	Environmental quality	The city has 35 pumping stations, 62 kilometers of propulsion networks and 1,118 sewers networks. Compared to the situation in 1994, it began to have sewers and propulsions of greater capacity, but due to the topography of the city the routes are longer and slower, a large part of the route is done by propulsion and therefore the number of pumping stations and rupture chambers. In addition to the above, we have: • Low content of dissolved oxygen in water. • Wastewater with a high content of organic matter and low pH. • High temperatures of wastewater. • Sedimentation due to low flow rates. The above sets up a favorable scenario for the generation of gases, such as hydrogen sulfide, which causes bad odors.	Odor Control program. The mitigation and prevention of offensive odors within the framework of the program compromise the use of good practices, best available techniques and mobile monitoring devices interconnected to a robust data collection and analysis system.

No.	Management	Problematic situation	Implemented solution
21	Environmental quality	There was no regulatory framework for the parameters and maximum permissible values for specific discharges to surface water bodies and public sewerage systems.	Control program for industrial spills. The regulatory strengthening through the formulation of the Technical Annex for Control of Discharges, which consists of a document that is an integral part of the Uniform Conditions Contract, as an instrument that allowed to specifically establish, which substances are prohibited or restricted to discharge to the sewer system and its maximum concentrations.
22	Environmental quality	Greater proximity to users through the offer of services and products that go beyond the aqueduct and sewerage, and support industry and commerce in matters related to water management and the environment in order to be more efficient, sustainable and therefore more competitive.	Responsible water management program - GRA. Provide support to its clients in the sustainable management of water resources within their processes and activities. The GRA has made it possible to share with ACUACAR users and clients all the knowledge and technologies that facilitate, not only legal compliance related to water management, but also to establish a Water Culture in their companies.
23	Environmental quality	The evaluation of the behavior of the quality of the water by controlling its quality in the receiving bodies and in the points located in the area of influence of the discharge (submarine emissary).	Water quality monitoring program. The monitoring and follow-up of surface natural bodies of water were worked on structuring the monitoring program and the different associated protocols.
24	Environmental quality	Absence of a systematic mechanism that would unify the planning, execution and control of the activities, processes and resources necessary to achieve the established objectives. Therefore, it implied the absence of a systematic vision of the organization and the failure to meet customer expectations.	Design, confirmation and implementation of ISO management systems.
25	Environmental quality	The opportunities for improvement in any quality system are those that help to strengthen every day compliance with the requirements of the implemented standard and these improvements are even more relevant when it comes to complying with a legal requirement such as the system of quality management and the accreditation of the Water Quality Laboratory.	Maintenance of the quality management system of the water quality laboratory.
26	Commercial	The process of registration, control and monitoring of urban projects was carried out in a semi-automated manner.	Technological and methodological control of contracting urban projects.
27	Commercial	The process of installing services in adverse communities was carried out in a semi-automated manner and under policies not in accordance with this market niche.	Technological and methodological control of service facilities and service facilities in communities with adverse economic situations through differentiated offers.
28	Commercial	Growth of the city.	Collection outsourcing
29	Commercial	Growth of the city.	Call Center optimization
30	Commercial	Growth of city users.	Methodological restructuring and PQR's technology module
31	Commercial	The billing process was carried out in a semi-automated way.	Technology and working methods to optimize the billing process
32	Commercial	The cash collection management process is carried out in a semi-automated way.	Policies and technological methods of collection management
33	Commercial	The portfolio management process was carried out in a semi-automated manner.	Policies and technological methods of portfolio management
34	Commercial	The process of suspension of services was carried out in a semi-automated manner.	Policies and technological methods of service suspension
35	Commercial	Only the Laboratory Meters was available.	Implementation of the Aguas de Cartagena S.A. E.S.P. meter inspection body.

No.	Management	Problematic situation	Implemented solution
36	Administrative	High number of providers within each family of materials and type of material, specialized suppliers proposing products that were not part of their catalog, becoming an additional marketer, negotiations with suppliers without price lists and decentralization of purchases, other processes that could be bought.	Purchase transformation plan and technological policies and methods for purchase management.
37	Administrative	The supplier registration process (supply chain) was carried out in a semi-automated manner	Technological policies and methods for the registration of suppliers.
38	Administrative	The process of contracting projects (works and labor) was carried out in a semi-automated manner	Technological policies and methods for contracting works and services.
39	Administrative	The analysis, control and monitoring with tools provided by the Contec system (previous technological development), it was necessary to prepare and download databases that then had to be refined and analyzed. Due to the volume of data and information, the above required the dedication of significant resources to analyze the data.	Technological tool for the management of the transport fleet, which allowed to improve the capacity for monitoring and reaction, analysis, decision-making and the design of strategies to obtain better results, creation of alarms, notification of events and creation of indicators.

Note: Taken from own measurements assessed in Excel (2020)

In the midst of the above considerations, it can be shortened that the registered examples of knowledge transfer consolidated in 54 thematic units (one solution for each problem situation) are concentrated in two types; the first is part of the transmission of knowledge, represented in 15 work methods and procedures. For its part, the difference of 39 is located as mixed, that is, a convergence between technology transfer and work methods.

Table 3
Classification of the type of knowledge transfer

Type of Assistance	Grand total
Knowledge; method	15
Mixed; Technology and methods	39
Grand total	**54**

Note: Taken from own measurements assessed in Excel (2020)

Table 4
Classification of the type of knowledge transfer by management area

Management	Type of Assistance	
	Knowledge; method	**Mixed; Technology and methods**
Technique	1	9
Projects and Loss Control		5
Information and Communication Technologies (ICT)		5
Environment and quality		6
Financial	3	
Commercial		10
Corporate and organizational development	6	
Communications and public relations	1	
Administrative		4
Occupational safety and health (OSH)	2	
Internal control	1	
Legal	1	
Total by type of assistance	**15**	**39**

Note: Taken from own measurements assessed in Excel (2020).

On the other hand, it was determined that the factor analysis of variance was the most beneficial methodological technique (Cruz and Koch, 2015; and Hollon, 2006) to assess the consequence of two or more variables (knowledge transfer: methods and mixed; technology and methods, in accordance with the indicated summary record) on the dependent transformable: business performance. The latter was obtained monthly (%) based on the average of two strategic metrics or indicators named: effective collection management and non-registered water loss index, both in percentage.

However, with regard to independent companies, there was an initial problem: their measurement was in whole numbers (monthly amount of each one), so they were changed to ordinal units, assigning them ranges of attributes together with the members of the management team of ACUACAR. Consequently, they were computed on a Likert scale, with 0.85 being those with optimal impact, and 0.15 being those with the lowest derivation, both based on corporate performance. In this way it was possible to apply the ANOVA, allowing the cardinal hypothesis to be tested. Under the aforementioned system, together with the members of ACUACAR's management staff, the consequences of the classification of the subvariables related to the knowledge transfer on performance in the limited period were analyzed and evaluated, which is consolidated in Table 5.

Table 5

Collection of the conceptual and operational variables of the study

Months	Corporate Performance	Technology and Methods	Methods
Jan-19	69%	4	2
Feb-19	72%	6	3
Mar-19	72%	8	2
Apr-19	73%	4	2
May-19	74%	6	1
Jun-19	75%	2	1
Jul-19	76%	4	1
Aug-19	75%	4	2
Sep-19	77%	5	1
Oct-19	76%	5	1
Nov-19	78%	8	1
Dec-19	79%	6	1
Total		62	18

Note: Taken from own measurements assessed in Excel (2020)

The compilation of company data, in deference to the knowledge transfer in the last year, allowed to test the hypothesis obtaining that the variables called methods and mixed: technology and methods, positively affected (sig. 0.027 and 0.028, respectively) the corporate performance. Table 6 groups the results of the variance factor contrast (ANOVA).

Table 6

Statistical - Result of the 3 factor ANOVA. Tests of Inter-subject effects Dependent variable: Corporate performance

Origin	Type III sum of squares	gl	Quadratic mean	F	Sig.
Corrected model	,019[a]	3	0,001	2,456	.002
Intersection	6,59	1	6,59	8099,789	0,025
Technology and methods	0,056	2	0,014	7867,768	0,027
métodos Methods	0,043	2	0,015	7869,431	0,028
Technology and methods*	0	0	.	.	.
métodos * Métodos Error	0,039	11	0,001		
Total	6,728	12			
Corrected total	0,059	11			

Note: Taken from own measurements evaluated in SPSS (2020).

a. R-squared = ,782 (adjusted R-squared = ,681)

Discussion and conclusions

The pertinent conclusions are presented below in the knowledge transfer framework from the Grupo Suez to Aguas de Cartagena S.A. E.P.S. in 2019. Based on its derivations, the endings associated with the central topic of the work and the general review of the literature are shown in order. Then a summary of the most important examples in the matter of knowledge transfer is presented, as well as the most notable effects of the quantitative study in terms of the contrast of the hypothesis are detailed and revealed. In the end, without meaning that it is not important, its limitations and future lines of research are proposed.

Conclusions of the report in relation to the literary framework and management

After analyzing the results presented in Tables 1 and 2, the determining role of the convergence of technology with work methods is observed, especially in the most sensitive areas of the value creation chain, which are represented by the technical management, projects and loss control, ICT, environment and quality and commercial. In all of them, solutions of this type that were implemented from the knowledge transfer processes, represent 97.2% of the total. The opposite occurs in the rest of the analyzed areas, where the predominance of actions based on the knowledge transfer with direct influence on work methods and procedures is evident (77.8%).

This is the case of the areas in which the management enabling processes are mainly developed, such as areas like: financial, administrative, corporate and organizational development, communications, public relations, safety and health at work, internal control and legal. In this regard, and by way of exception, the leading role of technology in solutions related to the administrative area is notorious, especially in terms of supplier management, project contracting and administrative control. Thus, in 2019, in general, 72.2% of all actions derived from the knowledge transfer process from the Grupo Suez to the company Aguas de Cartagena S.A. E.S.P., correspond to the search for convergence between technology and work methods.

From a point of view that refers to the context that gave rise to this study, it should be understood as a management opportunity that would invite to ask the following question: What would have happened in the management of ACUACAR in the framework of its most important indicators? How are the cash collection management and the non-registered water loss rate, if it had not been able to count on the knowledge of an operating partner such as the Grupo Suez? Obviously, it would have been difficult to incorporate significant improvements since the company lacked this knowledge, so it would have been forced to seek the support of other companies around the world, which were willing to solve the serious management problems that were identified in the different areas of the company to which this analysis refers.

The Grupo Suez has the knowledge and experience because it has consultancy contracts worldwide, but it was also willing to share it and transfer its technology to solve the problematic events mentioned in Tables 1 and 2, which in turn agreed that in a short period of time, solutions could be implemented that allowed to go from 69% to 79% improvement in corporate performance in 2019; all this thanks to the process of appropriation of the knowledge transfer by said Group, based on the management criteria, policies and business arguments that supported such solutions.

With regard to the literature update, the procedure and the techniques of the mixed-

court scrutiny (quantitative and qualitative), added to the results obtained, it is notable and commendable to point out that they will be of interest as reference and consultation to the academy, the control entities and the real sector. The outstanding role of the management and knowledge transfer, technology and innovation within organizations to increase competitiveness and productivity, has become a stop on the road for organizational reflection and, above all, for implementation of practices such as those shown in the knowledge transfer registry carried out by ACUACAR in relation to the assistance, support, guidelines and observations proposed by its operating partner: Grupo Suez, for each of the problematic situations and strategic indicators.

In the midst of the limited considerations, the paradigms of Blanco-Valbuena and Bernal (2018) are corroborated with this analysis; Marulanda, Valencia and Marín (2019); Matsuo (2015); and Terán-Bustamante and Mendieta-Jiménez (2019), who argue that the knowledge transfer, science and technology exerts a positive influence on the process indicators, which results in the competitiveness of Aguas de Cartagena S.A., as well as determining its importance to have an operating partner who has the experience and knowledge to know how to sort out each of the different queries that ACUACAR carries out regarding the improvement of its processes.

Practical implications

The study has several implications in the managerial field. Companies based on knowledge transfer will have to invest much more in training people in knowledge management, in order to transfer what they have learned to other businesses; such is the case of the Grupo Suez's relationship with Aguas de Cartagena S.A. E.P.S.

Based on the 54 examples of records or files alluding to the same number of problem situations to which a solution was found promoted or implemented by the operating partner Grupo Suez, in a pragmatic or practical way it is concluded that there was a knowledge transfer to Aguas de Cartagena S.A. in 2019, which resulted in the effective improvement of competitiveness, productivity and the improvement of its processes.

Finally, it is necessary to indicate that the adequate knowledge management of the Grupo Suez is based on applying the learned and apprehended strategies that make the knowledge transfer possible, given its operations in the five continents. The help of technology, like that of methods and procedures, is a variable that must be used; especially when it comes to sharing what is in the knowledge repositories, for example: files, education, lessons learned, communities of practice, and good routines.

Limitations and future research

This research has the following limitations: the measures to test the hypothesis are based on the psychometric perceptions of the ACUACAR management team to evaluate the impact of the independent variables: methods and mixed; technology and procedures on corporate performance, which would imply a bias with respect to the other company employees because they did not participate in the exercise. In the same sense, managers have appropriated the variables of organizational culture, strategy and leadership in subordination of knowledge transfer due to their close relationship with the members of the Grupo Suez management team, but they would not know to what extent the rest of the collaborators would evaluate the relations of the constructs in reciprocity of ACUACAR and Suez.

As next lines of research, it is suggested to carry out a study using structural equations to know the interaction of all the observable variables since in the current one only three were operated.

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Appendixes

Appendix 1

Structured knowledge transfer record format instrument

a. Introduction: The process will make an introduction to the conflictive or problematic situation, risks or opportunities for improvement of its processes, activities, tasks, tools and equipment that it is desired to improve with the transfer of technology or knowledge by the operating partner. This information will be written in prose and preferably a diagrammatic outline of the bounded problem will be presented.

b. Conflictive or problematic situation: This part will address the problem, risk or opportunity for improvement that requires a solution through technical assistance within the framework of technology transfer and knowledge with the operating partner. This information will be written in prose and will present data or empirical support of the problem situation, in other words, numerical or metric aspects consolidated in tables, indicators or figures.

c. Solution to the problematic situation, risk or opportunity for improvement: It will be provided by the operating partner but documented by Aguas de Cartagena S.A. It will be written in prose and will provide models, numerical data, photographic records, used statistical techniques, all of the above delivered in tables, indicators or figures.

d. Methodology: It will be defined by Aguas de Cartagena S.A. based on the technical assistance provided by the operating partner. It would include the following chapters:

1. Brief description of what is included in this section, also associated with the research paradigm, the methods and the research strategy to mitigate, reduce or eliminate the problematic situation, risk or opportunity for improvement.

2. Research design.

3. Hypotheses (if necessary).

4. Population and sample.

5. Analyzed variables.

6. Research methods and instruments.

7. Data analysis.

e. Results and limitations: A prose description of the results achieved after the end of the study will be made, according to the raised problematic or conflictive situation (and hypotheses, if applicable), risk or opportunity for improvement. It also includes the analysis and treatment of data, for which it is requested to present tables, photographic records and figures that guide the reader through the entire sequence of the obtained results or findings. Likewise, it should include possible innovations produced with the study, as well as limitations that have arisen and lines of continuity in subsequent analyzes (new research paths or new guiding principles: technology, methods, among other elements that the operating partner may have to provide).

1. Indicators: Tables or graphs will be presented with data on the indices or indicators related

to the problematic situation, risk or opportunity that improved because of the technical assistance of the operating partner, which will be documented by Aguas de Cartagena S.A.

f. Conclusion: Clear, precise and concise conclusion depending on the conflictive or problematic situation, proposed objectives, risk, opportunity for improvement or hypotheses, as the case may be. It is about making it clear and succinctly what was achieved with the technological or knowledge assistance, including those aspects that slowed down or hindered the proper development of the study. Precisely from the contradiction between what was thought to be done and what was achieved, gaps arise to be explored; which are those that are suggested to be investigated in the future, which is important to be written down by Acuacar.

g. Appendixes: Aguas de Cartagena based on the technical assistance provided by the operating partner will plan them. They refer to more detailed information that complements the explanation of the results of the analysis, especially in terms of the methods, techniques, results of the application of the instruments and it can be documents, graphs, tables or any other complementary information that does not need to appear in text, but are important because they add value to the report. It is suggested that they are listed.

Annex 2

Productivity measurement instrument

Months

Corporate Performance

Technology and Methods

Methods