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The Role of Knowledge Management Process on the Valorization of the Knowledge Within an Algerian Society / Case of the Center for Technological Studies and Services of the Building Materials Industry, by Abbreviation CETIM, Subsidiaries of the GICA Group

Lamara Mahamed Amel

Higher Institute of Management and Planning- Algiers. Algeria.

Abstract:
This article deals with one of the managerial devices necessary for the valorization of the knowledge available to a company in order to create a strategic advantage. Through a qualitative research by single case study, our primary objective was to verify the existence and functioning of knowledge management process for the valorization of knowledge within the Center for Studies and Technology Services of the Building Materials Industry. (CETIM) Subsidiary of the Groupe Industriel des Ciments d'Algérie (GICA), then to demonstrate how it allows the transfer of knowledge from the CETIM to the subsidiaries of the same Group and consequently, obtaining a strategic advantage from knowledge transferred.
Through the analysis of data collected, since the period from 2020 to 2022, in the field from two (02) methods of investigation (observation and interviews), the results showed that in addition to the managerial devices included in the literature review and set out in the conceptual framework, other operational mechanisms involved in the valorization of knowledge have been identified in the field.

Keywords: Knowledge, Knowledge management, the managerial devices, CETIM, GICA, the valorization of knowledge.

1. Introduction:

The success of a company is hampered by several challenges, it must take into consideration on the one hand, the requirement for responsiveness in the face of market globalization, increasing competitive intensity and the growing power of customers, and on the other On the other hand, a strong development of information and communication technologies promoting exchanges both inside and outside an organization.

The break with classic strategic analysis, which is essentially based on data from the external environment, makes it possible to make the observation which leads to focusing on the internal strengths

that a company possesses. This is precisely the point of a major current of modern strategic thinking, which is the resource-based approach, or Resource-Based View. This theory invites us to build a company's strategy from the analysis of its own assets, in particular its intangible resources which have the characteristic of being more difficult to imitate or substitute, this represents a fundamental condition for creating a competitive advantage. **(Penrose E 1959 ; Wernelfelt B, 1984 et Barney J, 1991).**

Furthermore, the advent of the era of the knowledge economy has accelerated the renewal of strategic management and considered knowledge as the most important strategic asset of companies. Indeed, the knowledge-based approach or Knowlegne Based View is an extension of the resource-based approach, and proposes to introduce a new vision of the company based on the idea that it is defined by their ability to integrate and coordinate their knowledge and create new ones **(Conner, 1991; Barney, 1991; Kogut et Zander, 1992; Drucker, 1999b; Grant, 1996)**, and where their valorization makes it possible to strengthen or acquire a strategic advantage.

While integrating several approaches and models, the ambition of this article proposes to treat the knowledge management process which intervenes as a managerial device involved in the valorization of knowledge, and to answer the question: **How does the Algerian public enterprise valorize- does it use its knowledge to obtain (or maintain) a competitive advantage?**
To respond to this problem, we opted for a qualitative approach, oriented towards a single case study conducted within the Center for Studies and Services Technologies for the Construction Materials Industry, by abbreviation CETIM – Subsidiary of the industrial group cements from Algeria, by abbreviation GICA. Our choice for the Algerian technical center for the construction materials producing industry is supported by its contribution to technical progress, improved productivity and the development of the Algerian construction materials industry. It is being transformed into a technological center comparable to internationally renowned technological centers.
Our primary objective is to verify the existence and functioning of managerial mechanisms relating to the valorization of knowledge within CETIM, known for having focused its strategy on the development of subsidiaries of the same group. The second objective is to demonstrate how these managerial mechanisms allow the transfer of knowledge from CETIM to the subsidiaries of the GICA Group, and consequently, the obtaining of a strategic advantage from the knowledge transferred.

The methodology adopted follows:

- A hypothetico-deductive logic, according to which the body of hypotheses developed before the empirical study can lead to conclusions and draw a consequence from empirical research. These hypotheses will be invalidated or confirmed, based on a logic of demonstration or proof which must be proposed;
- And a constructivist paradigm, according to which constructed knowledge does not reflect an objective ontological reality but concerns the shaping of a world constituted by our experience.

The remainder of the paper is organized as follows: Section 2 reviews the relevant literature, Section 3 presents the research methodology, Section 4 results, section 5 discussion, while Section 6 provides the conclusion and recommendations.

2. Literature Review:

Beyond the subject-object separation, the individual is perceived as a subject who acquires knowledge by analyzing external objects. This knowledge can be: implicit, explicit, technical, protected and safeguarded, know-how, ability, linked to understanding, linked to measurements and the assessment system or even to a belief and values. All of these configurations are at the origin of a classification of knowledge according to two epistemological (tacit and explicit) and ontological (individual, collective, organizational and inter-organizational) dimensions.

During our research, we had to study these two (02) dimensions since the mode of valorization of knowledge is different depending on the nature of it.

Furthermore, knowledge management within a company is both strategic and tactical. From a strategic perspective, the company formulates a strategy to evaluate, create and maintain intangible assets and, thereby, aligns its knowledge management strategy with its overall strategy **(Birasnav M, 2014).** The tactical dimension, for its part, refers to all the management activities necessary to nourish the stock of knowledge, create an environment favorable to learning, and manage practices to achieve a body of knowledge aligned with that of the projects company driven **(Blaize H R and al., 2014 ; Driffield N and al., 2014).**

Based on the work of the authors cited in the previous paragraph, the work of **Charfi A and al, (2017)** and the daisy model of **Ermine J L (2018)**, we consider knowledge management as a process which consists to: 1) create (acquire and collect) business-relevant knowledge; 2) process them (formalize), 3) disseminate them (share), 4) enrich them (renew), 5) save them and protect them against imitation or loss.

1/ For knowledge creation : Noorderhaven and Harzing (2009), Hautala et Johiainen (2014) and Tsai et al., (2014) discuss the need to establish within the company a working environment that encourages social interaction, group work, frequent meetings, etc.

Cook and Brown's (1999) model of knowledge generation in practice evokes the notion of Knowing which considers that knowledge must have a relationship or interaction with the social and physical world.

The knowledge creation model based on the design activity of Hatchuel, Weil and Le **Masson (2015)** makes it possible to acquire new knowledge based on the Concept-Knowledge (C-K) process.

To these measures, **Simon (1991)** adds the need to recruit people with knowledge. **Popaitoon and Siengthai (2014)** suggest organizing frequent continuing training actions for company employees through, among other things, organizational learning, which is a process that generates knowledge from the individual level to the organizational level by passing through the collective level.

2/ For knowledge treatment:

Several authors emphasize the importance of formalizing, codifying and converting company knowledge from its raw form into a form that is understandable and usable by staff. **(Gold A H et al., 2001)**. The two conceptual visions (static and dynamic) of knowledge deal with the formalization, codification and conversion of knowledge.

3/For distribution and sharing of knowledge :

The SECI model (Socialization, Externalization, Combination and Internalization) developed by **Nonaka and Takeuchi (1995)** is part of their theory of organizational knowledge creation "The Organizational Knowledge Creation Theory Of The Firm", they emphasize certain practices within the company.

Sveiby (2001) develops Ten (10) strategies for sharing and converting knowledge through three (03) structures: 1) The external structure which is represented by the family of intangible relationships that an organization can have with its clients and its suppliers, 2) The internal structure which is represented by the management of actions within an organization and 3) Individual skills which is represented by the competence of technical staff, support staff and management.

4/ For the renewal (enrichment) of knowledge :

From its cognitive perspective, organizational learning with its three (03) levels (single loop, double loop and deutero-learning) corresponds to an enrichment of knowledge or a modification of belief and interpretation systems. It is based on the programmed development of knowledge and cognitive processes. Also, exploitation and exploration are two learning modes that promote the development of knowledge and skills within an organization.

However, the literature suggests the implementation of the same operational devices that the company uses for the creation and collection of knowledge.

5/ And finally, for the protection of knowledge :

The literature mainly focuses on the development of patents **(Della Malva A and Hussinger K, 2014; Perri A and Andersson U, 2014)** or even "Soleau envelopes".

Concretely, a company must learn to establish connections between its employees, that is to say, put together people whose cooperation will generate new and useful knowledge for themselves and for the company **(Bayad M and Simen S, 2003).** According to **Ballay (1999)** taken up by **Louati F and Hikkerova L, (2016),** knowledge management can go through four (04) elements, namely:

- Interaction (via group work, discussion, and sharing);
- Integration (via operational processes);
- Capitalization (via the processes of codification, accounting, standardization, backup, and reactivation);
- Transmission (via training and tutoring).

From now on, the wars between companies are about their ability to create, absorb and protect the knowledge they hold (and exclude competitors). The creation of knowledge constitutes the basis of the competitive advantage of organizations and in fact becomes the engine of economic growth.

As a result, the valorization of knowledge is at the heart of the strategic knowledge management process, which itself aims to structure and formally manage the knowledge capital of a company, in line with its strategic orientations and its needs. innovation and improvement of competitiveness, supported by a technological and organizational infrastructure, with humans as the primary place of interaction, creation and valorization of knowledge. In addition, the preservation and exploitation of knowledge related to organizational skills specific to a company's core business must be its priority.

Referring to the literature, the valorization of a company's knowledge involves the implementation of a set of structural, managerial and strategic measures to take advantage of its strategic scope. In our research, we are interested in managerial knowledge management systems. They represent the basis of our empirical work, in the sense that the conceptual framework, the hypotheses and therefore, the operational variables were developed from the different points treated in these devices.

This article deals with the knowledge management process which is considered to be one of the most important managerial devices involved in the valorization of knowledge. The literature review drawn up in this part corresponds to a basis which helped us to establish the operational variables necessary for our field investigation (section 4) but also, it armed us with arguments during the discussion of the data (section 5).

3. Research methodology / Paradigme:

All research work is based on a certain vision of reality, uses a methodology, offers results aimed at understanding or explaining epistemological choices which make it possible to control the research process and increase the value of the knowledge produced. The answer to the epistemological and methodological questions of a research as difficult as it seems, is obviously essential for multiple reasons, in particular to position a work and show its interest.

Our epistemological and methodological choice which is based on:

- The recommendations of a hypothetico-deductive logic by **David A, (1999),** according to which a body of hypotheses developed before the empirical study can lead to conclusions and draw a consequence from a general rule and empirical observation. These hypotheses will be invalidated or confirmed, based on a logic of demonstration or proof which must be proposed (see §3.1.).
- A constructivist posture **(Le Moigne J L, 2002),** in fact, the valorization of knowledge transferred from CETIM to the subsidiaries of the GICA Group is essentially based on interaction between individuals via group work, discussion and sharing, integration via operational processes, transfer via service provision which may include training and learning (tutoring) and then capitalization via codification, standardization and backup processes. It should be noted that the desire to grasp social reality based on the representation of actors does not constitute the aim of our research. Above all, it is a matter of producing the representation of a process by accessing the underlying logic of the individuals participating in its creation, without relying exclusively on their representations of the process in question.
- A qualitative approach, which is based on a single case study and which is centered on the contribution of CETIM in terms of valorization of knowledge transferred to the subsidiaries of the same industrial group (GICA Group), to analyze in a second step, the way in which do these subsidiaries exploit and capitalize on the knowledge transferred? This choice was motivated by the nature of our research question (how type) and by the comprehensive aim of our project (understanding). In addition, among the different research strategies offered which opt for a qualitative methodology, we have retained the case study, as a strategy for accessing reality.

3.1. Conceptual frame:

The conceptual framework has an organizational function, in the sense that it guides the thought process and the logic of the different stages. During the work, the conceptual validity of the research can be

tested by referring to the conceptual framework that is already constructed. We only advance knowledge by building, from existing knowledge, an adequate analysis approach.

It is essential to evaluate the results. We can compare the significant content collected by research tools and having already been submitted to a first study. The more adapted and complete it is, the finer and more subtle the analysis. There is no valid research without this double confrontation of the hypothesis, then the analysis with the conceptual framework. It will be useful to us insofar as it will allow us to put into perspective the elements and concepts necessary to address the research question cited in the introduction.

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However, the literature review provides support for the development of a conceptual framework, dealing with models of knowledge creation and transformation, knowledge management, as well as knowledge valorization. It offers a wide range of organizational measures that a company can implement to promote its knowledge capital. A summary of these numerous devices was proposed by **Charfi A et al, (2017)**, this allowed us to classify them into three main categories:

- **From a strategic point of view,** the general management of the company implements an institutional framework, a culture, a budget, processes and common tools to support the valorization of knowledge which it considers to be a strategic objective **(Grant RM, 1996; Davenport T H, 1998; Bück J Y, 2000; Veybel and Prieur, 2003);**
- **From a structural point of view,** the choice of a flat hierarchical structure **(Drucker P, 1999 ; Zghal R, 2002)** and a non-recurring type of work organization using project type processes **(Lorino Ph, 1995 ; Grant RM, 1996 ; Grundstein M, 2006**) appear to be able to facilitate the valorization of knowledge;
- **From a managerial point of view, (Nonaka et Takeuchi 1997, Alavi et Leidner, 1999 et Malhotra et Galletta, 2003)** propose a context and working conditions likely to enhance and take advantage of everyone's knowledge. This involves, for example, the establishment of a knowledge management policy and a culture conducive to sharing.

Aligned with the knowledge-based approach - Knowlegne Based View, this article deals with one of the practical managerial measures that a company can implement to enhance its intangible capital with a view to creating a strategic advantage. Our primary objective is to verify the existence of operational mechanisms relating to the valorization of knowledge in the technological study and service center of the construction materials industry of the GICA group, by abbreviation CETIM, reputed to have centered its strategy on the development of subsidiaries of the same group.

The second objective is to demonstrate how these systems allow the transfer of knowledge from CETIM to the subsidiaries of the GICA Group, and consequently, the obtaining of a strategic advantage from the knowledge transferred.

The elements of these systems dealing with the valorization of knowledge were studied based on the concepts and models studied in the literature review. These elements include:

- **-For the creation of knowledge :** the SECI model (Socialization, Externalization, Combination and Internalization) according to **Nonaka and Takeuchi (1997),** the model of knowledge generation in practice (Knowing) according to **Cook and Brown (1999),** organizational learning according to **Crossan and his collaborators (1999)** and the C-K model of knowledge creation based on the design activity according to **Hatchuel and his collaborators (2002),** it traces the evolving and structuring nature of the knowledge generation processes;
- **For the treatment of knowledge**: Several authors emphasize the importance of formalizing, codifying and converting the company's knowledge from its raw form into a form that is understandable and usable by staff **(Gold A H et al., 2001)** . The two conceptual visions (static and dynamic) of knowledge deal with the formalization, codification and conversion of knowledge;
- **-For the dissemination and sharing of knowledge:** the SECI model according to **Nonaka and Takeuchi (1997)**, Ten (10) strategies for sharing and converting knowledge according to **Sveiby (2001)**.
- **For the renewal (enrichment) of knowledge:** organizational learning with its three (03) levels (single loop, double loop and deutero-learning) according **to Argyris and Schön (1978)** then **Argyris (1990)**;
- **And finally, for the protection of knowledge:** the literature mainly emphasizes the development of patents **(Della Malva A and Hussinger K, 2014; Perri A and Andersson U, 2014)** or even "Soleau envelopes".

All research must be based on a certain number of propositions or hypotheses, they represent answers to questions previously formulated using existing literature and the research context. The formulation of a research hypothesis represents the culmination of conceptual reflection. They will be confirmed or denied. As will be seen later, this step also constitutes the first step towards the empirical part of the research. This is therefore a pivotal point. Therefore and to answer our main question, the following hypothesis is put forward:

The outcome of each service/process requires acquisition, formalism, sharing/transfer, renewal, and safeguarding/protection of knowledge.

Correlatively, the translation of operational devices into operational variables that can be observed in the field, confronts the hypothesis developed above with the reality of the Center for Studies and Services Technologies of the Construction Materials Industry, CETIM (by abbreviation). The following table summarizes the variables retained to operationalize the research model.

Table No. 01: Operationalization of the conceptual model.

Theoretical concepts		Operational variables
Knowledge management process	Creation, collection or renewal of knowledge	- Existence of a context favoring the creation of knowledge internally; - Creation of new knowledge through organizational learning (social interaction, group work, frequent meetings, etc.) **(Crossan and al, 1999) ;** - Acquisition of new knowledge (recruitment, subcontracting, etc.) **(Simon, 1991).**
	Processing or	- Organizing, codifying and converting the company's knowledge

	formalization of knowledge	from its raw form into a form that can be understood and used by staff **(Gold A H and al., 2001) ;**
	Diffusion, sharing or intra- and inter-organizational transfer of knowledge	- Role of dialogue and the exchange of concepts and models in the "externalization" of knowledge (tacit to explicit) **(Nonaka and Takeuchi, 1997 ; Hatchuel and al., 2002) ;** - Role of practice, documents, manuals and procedures in the internalization of knowledge (explicit to tacit) **(Nonaka and Takeuchi, 1997 ; Cook and Brown, 1999);** - Role of observation, imitation and experience in the socialization of knowledge (tacit to tacit) **(Nonaka and Takeuchi, 1997, Ermine J L, 2018) ;** - Role of meeting, conversation and use of information systems in the combination of knowledge (explicit to explicit) **(Nonaka and Takeuchi, 1997 and Hemlin S, 1999**) ; - Existence of rules and directives facilitating the integration of knowledge at minimum cost and time **(Grant RM, 1996).** - Role of the organization of work in sequences in the integration of the knowledge of each specialist in the sequence reserved for him **(Grant RM, 1996).** - Role of routines in the integration of knowledge and obtaining the best performance of each person in the sequence reserved for them **(Grant RM, 1996).**
	Safeguarding and protecting knowledge	- Safeguarding and protecting knowledge (company properties) against loss or imitation **(Arrègle JL, 2006).**

3.2. Data:

A/ Case Selection:

Our research object has the advantage of having a well-defined field of investigation, essentially, centered on the valorization of technical knowledge transferred to clients, with the highlighting of the different operational devices that an organization can establish to create a competitive or even strategic advantage. Indeed, the Center for Studies and Services in Materials Industry Technologies of construction, by abbreviation CETIM – Subsidiary of the cement industrial group of Algeria, by abbreviation GICA has the essential mission of contributing to technical progress, improving productivity and the development of the construction materials industry, in particular, subsidiaries of the same group (GICA Group). Also, it acts as an interface between the company and the University for Research, training and economic intelligence activities. It is the Algerian technical center for the industry producing construction materials such as cement, concrete, lime and plaster, bricks, tiles and ceramics, etc.

The Algerian cement industrial group, by abbreviation GICA, of which CETIM is a subsidiary, is an economic and strategic player in the country, and is configured into: Fourteen (14) cement companies, Three (03) aggregates and BPE, One (01) construction materials distribution company, two (02)

maintenance and industrial assembly companies, one (01) training and development company, one (01) security company and a training center technical assistance (CETIM).

CETIM has existed since 1965 under other forms and names. It inherited from its predecessor companies experience and know-how gained during more than fifty-seven (57) years of activity in the cement industry. Indeed, CETIM is the result of successive restructurings undergone, starting in the Eighties (1980), by public companies responsible for the development, production and marketing of construction materials. Currently, in addition to these non-subsidiary customers, CETIM is the study and engineering center serving the Fourteen (14) cement plants and the Three (03) aggregates and BPE companies (all subsidiaries of the GICA group).

As a corollary, **Barcelo (1992)** believes that the industrial sector, in relation to economic intelligence, values knowledge and considers it to be one of the key sectors of the new economy focused on human wealth.

Indeed, with more than 79% qualification of its workforce (statistics for the year 2021), broken down into: 55% engineers, masters, magisters and doctors, and 24% senior technicians, technicians and of DEUA, and an average experience per agent of Thirteen (13) years. CETIM has a skills and knowledge management policy centered on three (03) dimensions: cognitive (knowledge), technical (IT) and managerial (direction, motivation, etc.). He seeks to develop his knowledge at three (03) levels :

- The knowledge learned during the realization of its various services and strategic projects;
- The tacit and explicit knowledge acquired in the various meetings, it concerns the overall functioning of the company (means and priorities), the strategy and policy of the company, the management control procedures and monitoring Standards;
- Knowledge acquired through adaptive type learning (individual) or that which comes from generative type learning (collective or even organizational).

Our empirical work takes into account the study of the organizational and inter-organizational level with issues on the external environment. Our selection of cases focused on CETIM, because the creation, acquisition, and transfer of knowledge is at the heart of its service provision (activities), the most important are:

- Testing and analyzing the characteristics of raw materials and products in the construction materials industry;
- Support in terms of development and production support for industrial projects ;
- Carrying out audits (quality and technical), expertise and inspections;
- Monitoring and support for certification (product, system), example of the API certification and approval project for petroleum cement at the Ain El Kebira Ciment Factory (SCAEK);
- Metrology services (calibration and verification of measuring instruments), topography, environmental studies;
- Applied research on construction and innovative materials.

However, the quality of the services cited above is recognized essentially by :

- The French Accreditation Committee (COFRAC) with from 2000 to 2016, accreditation No. 1-1110 to the ISO/IEC 17025 standard for testing
- The Algerian Accreditation Body (ALGERAC) with :
  - From 2017 to date, accreditation No. 1-2-024 to the ISO/IEC 17025 standard, for Thirty-two (32) tests and ;

  - From 2015 to 2018, accreditation No. 1-1-007 to the ISO/IEC 17025 standard for the temperature quantity;
  - From 2019 to date, accreditation No. 1-1-020 to the ISO/IEC 17025 standard, for the Temperature quantity (from -40 °C to 140 °C) and the Mass quantity (from 1 mg to 10 Kg on class F1).
- The mandate of the CACQE, Ministry of Commerce, for quality control of materials ;
- The Algerian Institute of Standardization (IANOR), for product certification management projects and standards monitoring ;
- The Ministry of Industry and Mines, to obtain approval for studies to upgrade and implement quality assurance systems.
- The Ministry of the Environment and Renewable Energy, for obtaining approval for environmental studies.
- The partnership between the National Environment and Sustainable Development Organization (ONEDD) and CETIM for monitoring liquid effluents and atmospheric discharges from classified installations subject to environmental regulations.

To be able to claim to have covered the arguments linked to our selection of cases, the technological development of organizations motivated by the preponderance of innovation in certain economic sectors remains one of the arguments directly attached to the operational mechanisms of valorization of knowledge.

B/ Data collection:

Our research aims to analyze our object of study at the time of observation and through space, the information collected is concentrated in the present and in the near past. In other words, our work focuses on the valuation at a given moment, and not on the evolution of the object studied over time. Also, depending on the problem, the unit of analysis can concern the individual, the group, the organization as a whole, the inter-organizational, the interrelations between several levels. Determining the level of the unit of analysis sets the limits necessary for data collection, and thus influences the analysis and interpretation of the latter. Regarding our research, the level of analysis retained is the organization as a whole, but also the influence it has on the subsidiary organizations of the same group. Thus, the scopes of our study is intra and inter organizational, point A/ Case selection, presents the organization of the GICA Group and the relationship of CETIM with the subsidiaries of this group, mainly those concerned by this study.

The two (02) main data collection methods used in our research, namely: observations (participants and non-participants) and questions via questionnaires or interviews.

Dans notre étude de cas, nous avons eu l'opportunité d'avoir accès :

To the two (02) types of observations:

- **Participant observation:** As a CETIM employee, the interaction with the people interviewed during the interviews was very useful to us in choosing the subject of our research, because we ourselves participated in transfer projects. knowledge of CETIM towards Four (04) cement plants (SCAEK, SCIZ, ECDE and SSC) of the GICA group and one (01) private cement plant SARL AMOUDA INGENEERING. This participant observation allowed us to participate in the drafting of second-order data, such as contracts and their amendments, monthly project progress reports, activity reports, etc ;

- **Non-participant/passive observation:** This method of data collection allowed us to have second-order information, mainly from the Technical-Commercial Management of types: customer satisfaction survey reports, service contracts carried out or in progress, missions with knowledge transfer, etc.

To the Three (03) types of questions:

- **The speech interview,** was used in the maturation phase of the research subject, with two (02) people: on April 16, 2020 with the former Head of the Industrial Division who is the current President and CEO of CETIM, then on February 25, 2021 with the former President and CEO of CETIM and when choosing the people to be interviewed, with the current CEO on February 8, 2022;
- **The semi-structured interview,** Three (03) additional interview guides were carried out: the first for the CETIM supervisory staff, the second for the directors of the GICA group and the third for senior managers of the GICA Group subsidiaries. They were developed based on the conceptual framework and the identification process of the case study. They were enriched and clarified as the empirical study progressed. The interviews carried out with the directors of the Group and the subsidiaries were intended to refute or confirm the responses collected from CETIM supervisory staff.

  The interviews lasting an average of an hour and a half, carried out with CETIM supervisory staff as well as the group's directors, were conducted at the workplace and during working hours. Regarding the interviews carried out with the managers of the GICA group subsidiaries, they were carried out remotely via telephone calls. These interviews took place:
  - For CETIM supervisory staff, during the period from February 28 to March 10, 2022;
  - For directors of the GICA group, March 13 and 14, 2022;
  - For managers of GICA Group subsidiaries concerned by this research, during the period from March 18 to 24, 2022.
- **The directive interview,** a questionnaire was developed as simply and clearly as possible, with brief and targeted questions in order to maximize response rates. Its writing made it possible to verify the existence of a transfer of knowledge from CETIM to the subsidiaries of the same group (GICA), focused on the one hand on the development of these subsidiaries and on the other hand, on obtaining a strategic advantage for CETIM. It was designed on Google Forms, sent by email to more than Sixty (60) people, with a return of Thirty-one (31) responses. One in two people who received the questionnaire therefore responded. The respondents are directors, department heads and service heads of fourteen (14) GICA Group subsidiaries.

In total, Fifty-three (53) interviews were carried out and are distributed as follows:

- Three (03) non-directive interviews with the CEOs (former and current) and the head of the Industrial Division of CETIM;

  Nineteen (19) semi-structured interviews divided into: Ten (10) with CETIM supervisory staff and Five (05) with directors of the GICA group and Four (04) with directors of subsidiaries of the GICA group;
- Thirty-one (31) responses to the directive questionnaire sent to senior managers (director, department head and service head) of the GICA group subsidiaries.

4. Result:

4.1. Data analysis:

Qualitative data analysis has been the subject of numerous publications; it involves examining and interpreting data in order to develop answers to questions.

The main steps in the analysis process are to identify the topics of analysis, determine the availability of appropriate data, decide which methods to use to answer the questions of interest apply the methods and to evaluate, summarize and communicate the results.

However, the textual data analysis method is the most popular method for studying data collected through questions and observations, and therefore, the most appropriate for our case study. Today it brings together many methods and tools, which aim to discover the essential information contained in a text.

Taking into consideration that discourses (field investigations) constitute a privileged entry into the object of study of management researchers and among the Four (04) major families of textual data analysis, namely: lexical, linguistic, cognitive and thematic, thematic analysis is the chosen method because it relates the content of the data collected to pre-established themes. In other words, it follows deductive reasoning, and therefore makes it possible to verify or validate predefined hypotheses, and consequently, is part of the epistemological posture chosen at the start.

Behind the generic term content analysis, numerous manual tools were first proposed (concept grid, counting of propositions, expressions, etc.).

Currently, IT offers facilities that make it possible to provide new assistance to analysts. Indeed, software can provide significant assistance in the organization and processing of data, even if the desired results are qualitative.

Furthermore, thematic content analysis includes most of the steps to follow for the analysis of the data collected during the semi-structured interviews.

These steps are :

a/ Pre-analysis of data :

This is the preliminary stage of intuition and organization to operationalize and systematize the initial ideas in order to arrive at a diagram or an analysis plan, it includes :

- **the choice of documents to submit for analysis**, in our case, we transcribed the interviews by hand, in a logbook then reproduced on digital media, with everything the interviewees were able to say, without changing the text, without the slightest interpretation or judgment. With more than Twenty-four (24) hours of recordings, or Seventy (70) hours of transcription, each interview is transcribed into a separate file, in total more than One Hundred (100) pages of verbatim, entered on a computer in Word format. However, for better control of the information collected, no voice recognition software was used, because certain words can be distorted, particularly technical words.
- **The formulation of the initial hypothesis and the objectives**, which will be compared with the results obtained and therefore, this will be confirmed or refuted.
- **The development of indicators on which the interpretation of the results will be based,** the way of choosing the field of study and that of analyzing the data collected are the two aspects of the qualitative research approach which must be more particularly examined, in fact, the CETIM is the Algerian technical center of the industry producing construction materials, such as cement and concrete, and has the main mission of contributing to technical progress, improving productivity and

developing the construction materials industry. It is currently being developed into a technology center, comparable to internationally renowned technology centers. Therefore, future research could focus on the transferability of our results to other areas of investigation.

b/ Data coding:

Coding is a meticulous, manual process for which there is no described automatic system. It classifies and transforms qualitative data, which should be transcribed, before proceeding with their coding. It was carried out for the data collected during semi-directive interviews only, the second-order data, for their part, will fuel our reflection in the discussion section of the results. Therefore, the coding grid is carried out on the transcribed interviews which are represented by paragraphs of meaning composed of groups of sentences which refer to ideas.

The choice of code assignment can be established after data collection or determined in advance based on the study objectives. In our research, this choice was determined in advance and based on the research hypotheses. It corresponds to the attachment of the chosen unit of analysis to functions called "Nodes" in the terminology of the textual analysis assistance software (Nvivo). These nodes are mainly used to classify the data content into codes/themes, each theme covered in the different interviews is possible to be selected and can be coded into an appropriate node, with the result of finding all the extracts dealing with this theme in a single place, a single node.

The coding grid used is of the closed type, because it is composed of operational variables established a priori according to a deductive approach. These variables allowed us to develop the questions contained in the interview guides. Indeed, once we were able to illustrate our conceptual framework, its operationalization helped us to highlight the theoretical concepts as well as the operational variables.

c/ Data processing assisted by Nvivo software:

The software chosen to assist us in our data analysis is the Nvivo version 12 Pro software, because in addition to its main objective which is to help manage, format and give meaning to qualitative data, it is designed according to a manual approach, that of paper-and-pencil analysis (**Descheneaux et Bourdon, 2005**).

The principle of software analysis is based on an approach of decontextualization-recontextualization of the corpus **(Descheneaux, 2007).** This decontextualization consists of taking an extract of the text out of the real context in order to make it semantically independent with the aim of creating categories, also called themes. In addition, the use of Nvivo aims to "store information, classify it, organize it and then […] carry out search operations" **(Descheneaux and Bourdon, 2005).** According to a logic of automatic classification or framework fixed in advance, it facilitates the manipulation of data and helps to extract meaning from paragraphs.

Codification operations are decided by the researcher and him alone, the objective being to produce an analysis and not a catalog of ideas or quotes. Indeed, After importing the data from the interviews, we proceeded to introduce the different themes included in the interview guides in the "Knots" category. Subsequently, the overall corpus of analysis is cut into units of meaning (process of decontextualization-recontextualization of the corpus), each time one of the themes is identified, the analysis places all of the extracts attached to this theme in one place.

Once the data is coded, advanced data exploration is done using multiple wizards to perform queries on the software in question, so the presentation of the analysis results can be done.

4.2. Result of data analysis :

During the data collection phase, we based ourselves on the interview guide to have answers to the same questions in order to be able to compare them. The different sections set out in this theme are four (04) in number:

A/ Creation and acquisition of new knowledge :

The contexts favoring the creation and acquisition of knowledge mentioned by the people interviewed are :

- The market need, which corresponds to a demand for new services, never provided by CETIM, the satisfaction of this need requires the creation and acquisition of new knowledge via the assistance (partnership with) foreign companies or consultants mainly former cement manufacturers;
- The monitoring of each project or service has generated an exchange of knowledge between colleagues, with the client or with subcontracting partners (foreign service provider, consultant or design office), this context is of a relational type, the example given by one of the interviewees is that of the intergenerational transfer of knowledge during the collaboration between former cement workers and young engineering executives from CETIM. Example of verbatim extracts from the interviews: "*These exchanges promote the creation, acquisition and transfer of knowledge. they also made it possible to capitalize on knowledge and therefore to take up identical projects without any assistance, such as the project to create the Saoura SSC-Bechar cement plant*";
- The state strategy which concerns the decision to minimize expenses linked to studies in partnership with foreign design offices, is a context which pushed the CETIM to work on projects after having acquired all the knowledge and skills necessary for their monitoring;
- The strength of the GICA Group with the presence of fourteen (14) subsidiary cement plants helps CETIM to better withstand unfair competition from the private sector;

Other factors may be at the origin of the creation and acquisition of knowledge within the CETIM, they are: Training, continuous improvement of professional abilities, monitoring activity, Participation in seminars , fairs and conferences help create knowledge.

In short, the creation and acquisition of knowledge is done through training (internal and external), learning, experience, transfer (subcontracting, partnership, convention, intergenerational, in meetings, during a technical debate... etc).

B/ Processing newly created or acquired knowledge :

The transformation of knowledge from cognitive format (tacit) to paper or digital format (explicit), or vice versa the internalized knowledge (from documents to the employee) acquired, makes it possible to formalize and capitalize on the knowledge created and acquired, and feeds the information databases necessary for the provision of services, at the CETIM level, this has been done in a way for more than twenty years, because it is governed by the requirements of the ISO/IEC 17025 Standard Version 2017 or documentary control , audits and documentary reviews are reviewed periodically.

A third form of knowledge transformation which makes it possible to process and formalize the knowledge created or acquired, is the combination (one explicit knowledge produces another explicit knowledge), has been cited.

C/ Dissemination, sharing and transfer of knowledge :

The dissemination, sharing and transfer of knowledge is done internally during the provision of CETIM services and externally during the transmission of knowledge, the purpose of the services provided to its clients.

This point raised questions via semi-directive interviews with (14) people (ten (10) supervisory managers of CETIM and four (04) directors of four (04) subsidiaries of the GICA group, namely: SCIZ, SCAEK, SSC and SCHS) and directive interviews with Thirty-one (31) senior executives spread across Thirteen (13) subsidiaries of the GICA group. Furthermore, the semi-directive interviews carried out with the supervisory managers of CETIM concerned, among other things, the dissemination, sharing and transfer of knowledge internally and externally, the semi-directive interviews carried out with the directors of the subsidiaries mentioned above, allowed us to confirm the presence of knowledge transfer from CETIM to these cement plants, also, we verified, at the same time, the relevance of the questions of the directive interview. Regarding the questionnaire, it allowed us to verify all the information collected during this research, because the transfer of knowledge occurs automatically at the end of each service provided by CETIM.

The last question of the questionnaire indicates an appreciation of the knowledge transferred from CETIM to the Subsidiaries of the GICA Group, on the Likert scale ranging from 1 to 10 (the transfer concerns general to innovative knowledge), Fourteen (14) responded 8/ 10, Eight (08) responded 7/10, Six (06) responded (03) 10/10 and (03) 5/10, Two (02) responded 9/10 and One (01) responded 3/ 10. See the figure below.

On a scale of 1 to 10, how do you judge the quality of the knowledge transferred from CETIM to your company?

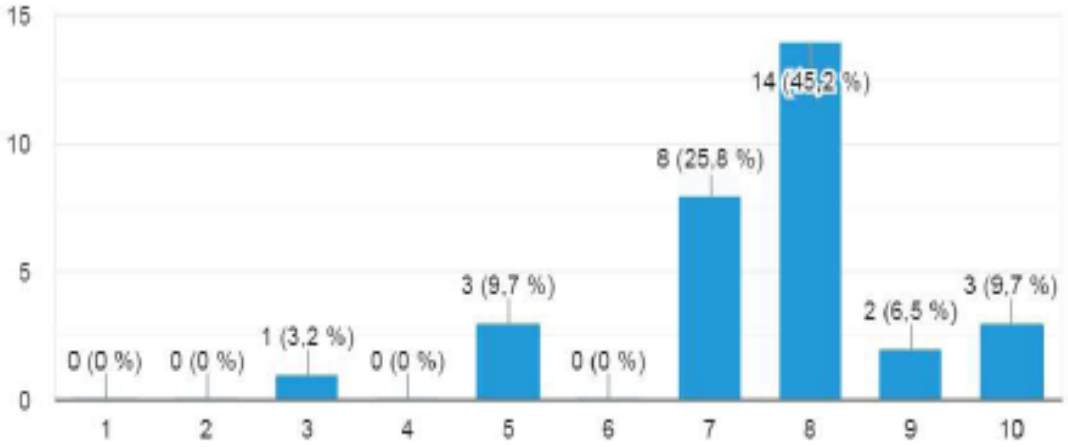

Figure 01 : Graphical illustration on the Likert scale of the quality of knowledge (from general (01) to innovative (10)) transferred from CETIM to its clients.

Our consultation of the customer satisfaction survey report for the year 2021, carried out with eleven (11) cement plants of the GICA group, only SCAEK, SCIBS and SCIZ did not participate in this survey. This report is based on seven (07) sections: Support for your expressions of needs, response to your technical aspect expectations, perceived quality of the report, opinion on the execution time of services, time to obtain the final report, quality/price ratio compared to the competition and your opinion on overall satisfaction.

Furthermore, we were able to note an overall satisfaction percentage of: 85% for testing services and 82% for calibration services.

D/ Knowledge backup:

All the people interviewed mentioned the existence of documentary backup, knowledge is saved in paper format, after the completion of each service, in binders or archive boxes at the level of each user structure to avoid their loss or damage. , access to these documents is open to any person with authorization from the head of the structure concerned or in digital format on external hard drives provided for this purpose.

5. Discussion:

The discussion of the results from our investigation in the field allowed us to compare these results to the review of the literature, and consequently to evaluate the concordance of the conceptual model thus developed with the elements noted in the field. Indeed, the survey carried out in the field helped us to verify the existence of operational mechanisms identified in the literature for their role in the valorization of knowledge in business.

The results obtained allowed us to list several operational devices involved in the different stages of the knowledge management process, namely, from creation, acquisition, processing, transfer to safeguarding of knowledge.

Furthermore and referring to the literature, and more precisely to the works of **Nonaka and Takeuchi (1997)**, **Cook and Brown (1999), Sveiby (2001), Hatchuel, Weil and Le Masson (2002) and Nonaka, Toyama and Hirata, (2008)**, the CETIM has:

- Contexts favoring the creation and acquisition of knowledge (market needs, new developments, etc.);
- Mechanisms necessary for knowledge conversion (exchanges, meetings, learning, training, etc.);
- Rules and guidelines facilitating the integration of knowledge;
- Documentary system developed;
- Organizational routines (presence of procedures, operating methods, work instructions, good practices, etc.);
- Training, learning, sponsorship and empowerment program for its staff;
- Skills, know-how and experience necessary for the transfer of knowledge to its subsidiary clients of the GICA group;
- Organizational strategy putting all people on the same informational level;
- Storage location for documents resulting from the various services carried out by its staff.

Indeed, despite the efforts made to create, acquire, process, transfer (internally and externally) and safeguard/protect knowledge, the systems put in place to ensure the last stage of the process aimed at protecting knowledge remain insufficient. The people interviewed explain that the vocation of CETIM consists of responding to the requirements of its clients by carrying out various services with deliverables at the end of each mission, which makes the protection of its knowledge almost impossible, nevertheless, the expertise and the know-how of its staff provides it with a certain security against any imitation of its knowledge.

Furthermore, during our investigation in the field, we were able to identify other elements in relation to the knowledge management process, emerging from the field and which play a role in the valorization of knowledge, they are: An adaptation of knowledge of the CETIM technical staff to the needs of clients, the capitalization of knowledge, the prerequisites for the knowledge management process (motivation, control and consensus).

6. Conclusion, limits and perspectives:

The main part of our work consisted of subjecting the conceptual model established, a priori, to field testing. For this, we first translated the characteristics of the managerial mechanisms linked to the valorization of the knowledge developed in the model into operational variables. Through qualitative research using a single case study, the characteristics of the model were compared to those identified at the Center for Studies and Services Technologies for the Construction Materials Industry, by abbreviation CETIM – Subsidiary of the industrial group of Algerian cements, by abbreviation GICA.

Through the analysis of data collected in the field using two (02) investigation methods (observation and questioning), the results showed that almost all of the operational systems involved in the managerial aspect are likely to help CETIM promote its knowledge. Indeed, and in accordance with the results obtained, we noted that in addition to the creation, acquisition, dissemination/transfer (intra and interorganizational), renewal, backup and protection, other operational devices are put in place for the management of knowledge with a view to its valorization, these mechanisms are: adaptation and capitalization of knowledge, as well as motivation, control and consensus as prerequisites for the knowledge management process.

Beyond this contribution, this thesis presents limits which we summarize in:

- This research does not address the company as a whole, only the dimension relating to managerial aspects were analyzed, in fact, organizational reality does not include all the variables necessary to understand it;
- The concept of tacit knowledge is difficult to observe and measure;
- The investigations were carried out with the supervisory managers of the CETIM, consequently, the role of all employees in terms of knowledge valorization could not be studied. This limitation is inherent to interview case studies. In fact, the people interviewed were the only ones to have provided us with the data collected;
- The descriptive nature of this research does not allow us to explain the role that knowledge development plays in company performance.

Taking into consideration all the limitations cited above, we can raise research perspectives to follow for future research which concerns:

- Operational devices not covered in this article;
- The strategic mechanisms linked to the valorization of knowledge, which a company implements: an institutional framework, a culture, a budget, processes and common tools to support the valorization of knowledge which it considers as a strategic objective;
- Structural mechanisms facilitating the valorization of knowledge;
- A more precise quantitative study which will give more validity to the results obtained in this research;
- Establishing a link between the valorization of knowledge and the achievement of a company's performance with a view to obtaining a strategic advantage.

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