

# The Role of Information and Communication Technologies (ICTs) in the Capture of Ideas and Organizational Learning

\*Adriano Júnior [Dias-diasadri@terra.com.br](mailto:Dias-diasadri@terra.com.br)

\*\*Ana Lúcia Ferraresi Schmitz [analucia.schmitz@gmail.com](mailto:analucia.schmitz@gmail.com)

\*\*\*Edis Mafra Lapolli [edismafra@pandion.com](mailto:edismafra@pandion.com)

\*Waldoir Valentim Gomes Júnior [waldoir@gmail.com](mailto:waldoir@gmail.com)

\* Master in Engineering and Knowledge Management, Universidade Federal de Santa Catarina.

\*\* PhD in Engineering and Knowledge Management, Universidade Federal de Santa Catarina.

\*\*\* PhD in Production Engineering, Universidade Federal de Santa Catarina.

**Abstract--** An analysis on how technological solutions of digital intelligence assist in gathering ideas and in organizational learning of companies. Presents a list of recommendations for managers on strategies that lead to a cycle of institutionalization of cultural change, allowing continuous adjustment of the establishments to the particularities of the business environments in which they are immersed. The research applied a qualitative approach, preceded by a literature review and a case study on one of the most effective platforms of digital intelligence, recognized as an innovator in the markets in which it is prospected. The theoretical contribution emphasized the organizational learning process, highlighting ICTs applied concretely to this context. The research was conducted with knowledge located at the organizational level, though it detected the impact on the current business culture on the knowledge located at the individual level. The results showed that the ICTs serve as tools for assisted production of knowledge and that such knowledges, when turned into strategies, trigger organizational learning, sparking a cultural change on the company, adjusting the latter to the business environment in which it is inserted.

**Index Term--** Knowledge, Knowledge Management, Creativity, Organizational Learning.

## 1. INTRODUCTION

It is not new that many companies succumb for the lack of awareness of changes in the professional environment in which they operate or because of the slowness in processing the necessary changes to survive in these environments. Other companies, though able to survive, bear great difficulties in growing in these environments. This is due to the low organizational learning, i.e., the company's low ability of cultural mutation.

In the process of organizational learning technology is paramount, though there are still gaps to be explored, such as the new technologies applied in the field of digital intelligence, which aid in the process, from idea collection, its development, maturing and conversion into insights, up to the generation of strategies that trigger cultural change, adapted to the new business environment detected.

It is in this context that the present research is inserted, adopting a qualitative method with literature review,

followed by a case study that approached the interpretation of a digital intelligence tool. This methodological path aimed at answering the question: **How do ICTs aid in the collection of ideas and in assisted production of strategic knowledge that trigger organizational learning?**

The research is also guided by the objective of highlighting the role of a technological tool, as assistants to idea collection, as well as production, evidencing and measuring of the effective knowledge application. Also, to present the managers of corporate strategies a list of recommendations that allow a continuous process of organizational learning based on knowledge management.

## 2. THEORETICAL FOUNDATION

### 2.1. Knowledge

With focus on generated or discovered knowledge, and also evidenced, from performing tasks contained in activities developed in the business processes, it is noted that knowledge is studied in three levels: a) individual level; b) group level; and c) organization level. Another line of research considers, also, knowledge in the interorganizational level, insofar as the supply chains and the clusters gained relevance in the economic and business scenario. In this sense, Stewart (1998) informs that the intellectual wealth of companies derives from the combination of three aspects of knowledge, which are: a) the set of tacit knowledges stored in the individual level and components of its individual competence<sup>1</sup>, which is lost when people leave the company; b) the set of explicit knowledges symbolized, in the level of the organization, by the instructions for procedures (best practices), routine manuals, diagrams and descriptions of business processes, brands, patents and even the products developed by the company, among others, and such knowledge remains in the firm when the individual or individuals that evidenced it leave the establishment; c) the set

<sup>1</sup> Individual competencies are derived from the set of knowledges, skills and attitudes of an individual.

of knowledges evidenced by the company's external clients, immersed in the interorganizational level, normally registered in databases for further analysis and process, which stays in the company even if the clients stop counting on the goods and services of the organization.

In the individual level, it is noted that the knowledge, fruit of human cognition, is based on preexisting data and information, generating a new knowledge. This new knowledge has, as its underlying axiom, the knowledge fruit of the human mind, from a chain whereby data is feeling, information is perception, and knowledge is cognition. Kant (1991) states that, from the mixture of experience with existence, comes knowledge as a result of the understanding

of reality. The act of understanding reality allows learning, that is, creating knowledge, which, to be considered authentic, must have concrete application to reality, thus being useful and universal.

Regarding the process of transmutation of data into information, then into knowledge, and finally into competence, Rowley (2007) informs that this is the hierarchy of wisdom, adding to this pyramid the fact that a knowledge, when applied in practice, transforms into competence that generates wisdom, in a sense that, if knowledge is cognition, competence is action and wisdom is intuition. The image below represents the teachings of this author:

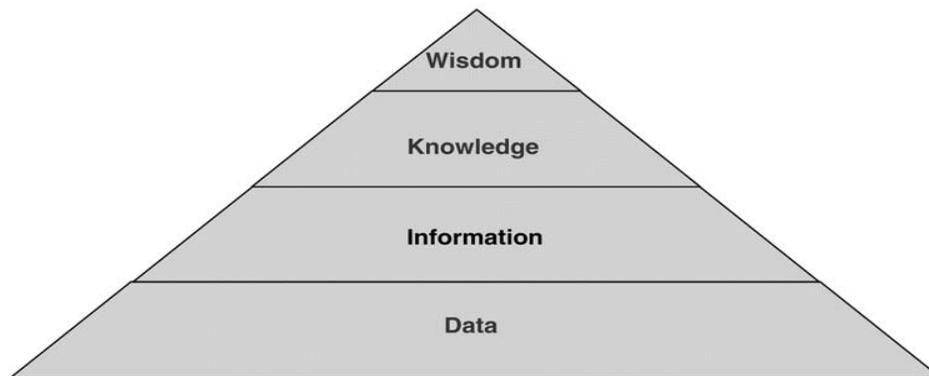


Image 01: Data, Information and Knowledge Hierarchy.  
Source: Rowley (2007, p. 164)

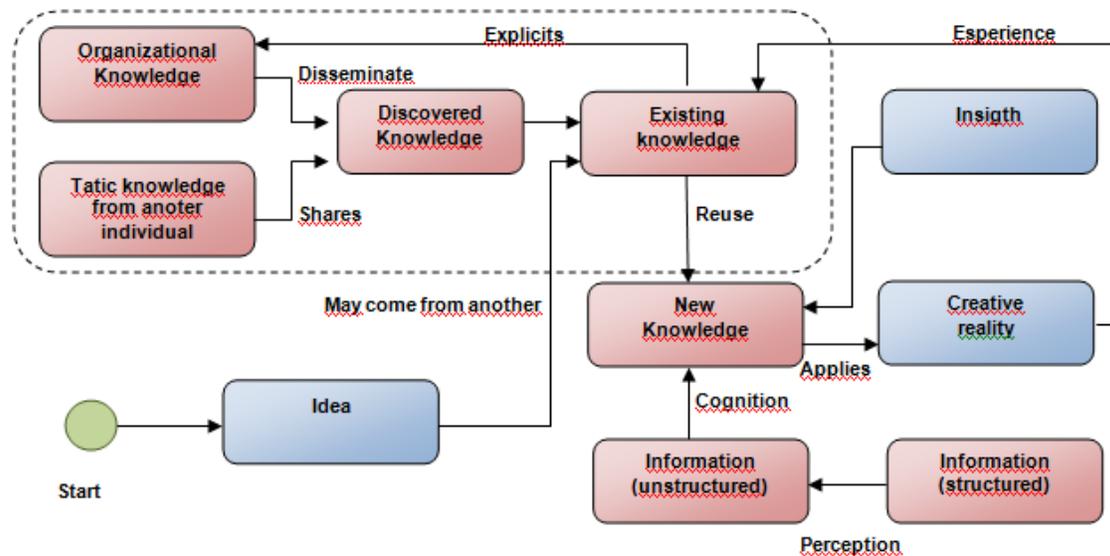
Apart from generating knowledge, the human mind can, also, discover knowledge, inserting it into the group knowledge. This occurs when an individual transmits knowledge to another individual through interactions that can be verified in person x person relations. Such relations induce the sharing of knowledge, either through dialogue or by observation of how a person acts or executes tasks.

Regarding knowledge on the organizational level, it allows the discovery of knowledge via person x artifact relations. These relations trigger the spread of knowledge and consider that it exists beyond the human mind.

This level of knowledge is mistaken for the interorganizational level, though a subtle difference can be verified if considered the context of a supply chain where the

artifact derived from a process of a company is part of the artifact resulting from the process of another company. Thus, the transmitted knowledge is not procedural, but substantive, resulting from an action, not being the action itself.

From the perspective of the transformation of ideas into creative reality, it appears that the chain of value of the knowledge goes beyond its generating through cognition. It advances to the competence through action, then gathering new stages, in order to form a second chain, whereby idea is result of creativity, insight is formed from preexisting knowledge, and creative reality materializes through the vision enhanced by new knowledges generated during its formation. The image below synthesizes this comprehension:



**Image 02:** Flow of conversion of ideas into creative reality.

Source: Authors (2014).

Image 02 demonstrates the comprehension of the chain of value of the knowledge and the flow of verified transformations. In it, the organizational knowledge, explicit, stocked as instructions for procedures, routine manuals and multidisciplinary knowledge bases, among other forms of storage, spread from person x artifact interactions, along with the tacit knowledge gathered into the mind of individuals and shared via person x person interactions, enables the discovery of knowledges that join preexisting knowledges of an individual.

Another stream in the process leads to the conclusion that the concept of insight is a result of generated or collected ideas added to the preexisting knowledge, leading to the conclusion that the sum of conceived insight, reuse of preexisting knowledge and available information allows the creation of new knowledge that, once applied in practice, embodies the creative reality that makes and organization grow. The preexisting knowledge, when evidenced, evolves into organizational knowledge, useful to the sustainability of companies and turning into their intangible assets. Therefore, the same knowledge that assists growth becomes useful to sustaining organizations.

The knowledge on organizational level, its management and the interactions between individuals are considered the birth of ideas.

## 2.2 Knowledge Management

The facilitation of creating, discovering and evidencing knowledge, as well as its use and application, are the main objectives of knowledge management. According to Fleury and Oliveira Jr. (2001), managing the knowledge created during person x person and person x artifact interactions, which occur in the execution of processes inside business environments, reduces and in some cases eliminates problems such as rework; low return on investments in training; customer dissatisfaction, as a result of the lack of tune between their expectations and the delivered values; low

results from the investments made in innovation; low use of the evidenced knowledges; and personnel turnover. For these authors, knowledge management, once it has been institutionalized, allows not only the individuals, but ultimately the organization to learn.

Sveiby (1998) asserts that knowledge management is a relevant strategic tool for organizations, with focus on people and their interactions, since technologies, in and of themselves, do not guarantee the expected results. From the human perspective, the profile of the knowledge worker is quite different from the profile of the traditional worker. The knowledge workers do not require control, but positive influence and that's where managers must excel. Drucker (2007) teaches that the knowledge worker is the sole responsible for his productivity, being that he manages himself, in order to attain an autonomy that motivates his productivity.

For Senge (1994), knowledge management demands that companies structure themselves as systems, in order to aid in learning and motivation of the knowledge workers, therefore allowing the discovery and generating of new knowledges, through socialization and combination.

Nonaka and Takeuchi (1997) explain that socialization occurs through the sharing of knowledge, where a worker observes another during the course of the latter's activities. Combination, on the other hand, happens by the spread of information and evidenced knowledges that trigger the generation of new knowledges, as well as the reuse of preexisting knowledges. The authors state that there are two other processes in the generation of knowledge, the exteriorization of knowledge, brought by the conversion of tacit into explicit knowledge, which demonstrates organizational learning; and the internalization, consisting of generation of a new knowledge, tacit, as a result of concrete application of an explicit knowledge.

Hence, the transformation of tacit, interiorized, knowledges into explicit, exteriorized, knowledges from the appropriate and noninvasive tools of collection that take advantage of past interactions is part of the theoretical contribution aimed to be displayed.

### 2.3 Creativity

Gurteen (1998) contributes to this issue when states that there is no creativity without a new problem or a familiar one that requires new solution, i.e., a challenging problem.

Holt (1984) points out that, although some transfer of knowledge between individuals do occur, they are not as effective as one would hope. For the author, adults and children learn more effectively through games and experiential techniques, as the means of the spoken and written word are ineffective.

Concerning the vulnerability of ideas, Gurteen (1998) claims that they are born invariably vulnerable and contradictory and, for that, are easily destroyed. Thus, some limiters of creativity and its development, especially in the business environment, are the starting weakness of ideas in an environment not prone to development of creative process, without freedom or interaction.

Creativity is closer to emotion. It is intrinsic to individuals and easily found in organizations, as long as the environment allows its development, especially in the search to do better what is already being done.

The Asian Productivity Organization – APO (2009) believes that new ideas and new learning emerge everyday from group dialogues and collaborative works. Thus, the problem is not in the lack of ideas and learnings, but in the absence of its capture and use. Due to the fact that new ideas and learning occur daily on the operation of the companies, these must be captured constantly, preferably without interfering on the routine of processes inside an environment that favors creativity.

Currently, there are emerging technologies that enable different ways to capture new ideas and learning, such as the capturing of text messages and voice recording, i.e., the communications between individuals arising from their interactions. These unstructured sources make up the biggest part of ideas and learning that occur in the corporate environment. For the APO (2009), the capture of learning and ideas systematically and collectively, as a means to, ultimately, survive and grow professionally and entrepreneurially in today's stiff markets, constitutes the most fruitful path to be followed by people, groups and organizations.

### 2.4 Organizational Learning

Companies, immersed in the environment formed by their target markets, depend, for their survival and growth, on the resources available in this environment. Knowing such resources, through perception and interpretation of the variables verified by the different angles of view, and using them in favour of the firm constitutes the key to organizational

learning. Given the natural dynamic of such environments, it is necessary to develop enough competences to monitor the changes that emerge and realign the strategy of the company.

Mintzberg *et al* (2000) define this cycle of knowing and monitoring to, again, know, as the “School of Learning”, according to which the strategy is a process that emerges from continuous analysis of the environment where people read it, assess the company's ability to deal with it and codify (put in evidence) the results of this reading and assessing, materializing the strategy. Santos (2005) corroborates this though, inferring that the process by which organizations learn is formed by numerous steps, the most important being understanding the environmental factors, deciding and adjusting the organization through strategic planning.

Regarding people, Lévy (1998) informs that, as individuals collectivize, transforming into unique cognitive individuals, open, imaginative and with initiative, better strategies are outlined in order to guarantee the company's success.

Still in relation to people, DeGeus (1998) teaches that organizational learning is the only competitive advantage that really sustains companies, highlighting that, during those latest years, the focus of the domain axle of existing resources in the business environment shifted from capital to knowledge, in a way that unless companies are able to improve the learning curve, their main asset, which is knowledge, will remain stagnant, allowing the occupation of the environment by the competition.

The process of organizational learning, according to Crossan, Lane and White (1999), consists of a framework based on four premises: a) to intuit; b) to interpret; c) to integrate; and d) to institutionalize.

Steil (2006), Argyris (2001) and Verburg and Andriessen (2011) show that organizations effectively learn in various forms, and go beyond, asserting that the technological advances have been influencing in the development of such forms, especially regarding idea collecting, an incomparable source of cultural change if registered during the process of collective reading and environment analysis under different referentials.

## 3. METHODOLOGICAL PROCEDURES

The research applied the qualitative method, with procedures of literature review and case study with demonstration of a technological tool of digital intelligence, especially in the audio capture and processing module, as well as its storing and indexing. Analysis of the gathered data enabled the generating and evidencing of theoretical contributions to the science, being that the primordial aspect of the research is the collecting and storage of ideas, as well as their development and maturation by interaction between individuals, until the achievement of the strategic insight.

Regarding the qualitative method, Bogdan and Taylor (1984) inform that it is best applied in cases which theory is adjusted to data, not the other way around. Cresswell (2007) offers another referential, stating that such method grants meaning to the experience of the researchers that participate in

the detailed demonstration of the collection, storage, indexing and audio analysis module.

As for the the literature review, Andrade (2003) shows that such a procedure can justify the choice of topic and also determine the purpose of the research. Still on this topic, it is worth highlighting the teaching of Vergara (2000), whereby this procedure greatly helps in systematizing the knowledge necessary for the research. The author reminds that the revisions are made on published materials, therefore accepted by the scientific community.

Concerning the case study in a technology-based company headquartered in Florianópolis. This procedure, according to Bruyme, Herman and Schoutheete (1982), enables gathering numerous and detailed information and insights that allow understanding of the totality of the object of study, properly contextualized by the literature review.

The tool demonstrated in the company, object of the case study, was due to being the only one built for the specific purpose of serving as an assistant in the production of knowledge, and for it adopting a synergistic process between the technologies of intelligence and of telecommunications, which supports the interaction between individuals as the main basis of the knowledge generation. Its demonstration allowed evidencing the role of the newest ICTs in the collecting of ideas and in the organizational learning process.

## 4. RESULTS AND DISCUSSION

### 4.1 The Case Study

Demonstration of digital intelligence platform INTELLETOTUM occurred in a technology-based company with thirty four years of existence, based in Florianópolis, Santa Catarina, delivered by a business analyst specialized in the diagnosis and support of customer needs in times of market research.

The technological structure has large number of interoperable tools that enable the collecting of data and ideas, their processing and assignment of contextual meaning, as well as their delivery via instruments that assist analyses through many different referentials, guiding users in generating and discovering knowledge, in what may be called a technological framework of assisted production of knowledge.

A greater amount of attention was paid to the tools of collection, indexing, storage and contextualization of data and unstructured information, their analysis and evidencing of generated and uncovered knowledge, given the understanding that ideas always orbit the field of unstructured materialized information, in this case, the interactions between people via emails, discussion boards, chats and also recorded audio of dialogues occurred in the meetings held in person or via voice conference.

Obtaining the maximum amount of information regarding the unstructured information analysis tool and knowledge evidencing was sought, in order to contextualize the method for development and maturation of ideas, and the consequent evidencing of the knowledges generated and

discovered during this activity, as a means to achieving all the research objectives.

All data collection was guided by the theoretical foundations that define organizational learning as a process of generation and discovery of knowledge from the ideas raised during the analysis of the business environment in which companies are inserted, their evidencing and use in the form of strategies that, once applied and internalized as company culture, provide its adaptation to the aforementioned business environment in which the firm is immersed.

The operating principle is simple, but of high implementation complexity. It starts with the configuration of powerful devices classified as: a) collecting of e-mails and chats; b) collecting of web pages of discussion forums; and c) of audio encoded into data packets. The e-mails are collected from the discussion groups designed for the participants of the environment analysis to express themselves.

The collecting of chats occurs from internal chat services configured to allow communication of the same participants of virtual prompted discussions, grouped into "themed chat rooms". The procedure for collecting assertions in discussion forums is analogous, i.e., specific forums for discussion of the business environment are set up and the participants record their beliefs, ideas and other assertions, which are collected by appropriate technological devices.

The audio collecting, on the other hand, is a bit more complex. The tool allows for the recording of words and expressions that are enhanced by the use of ontologies and the resulting framework is converted into audio waves used to scan recordings of themed voice conferences. As the words and expressions are identified, "pointers" indicating their location in the audio tracks are stored and indexed as unstructured source of data.

### 4.2 Discussion

It is worth noting that these are perceptions of researchers, collected during the demonstration of the features and functionality, since it was not possible to obtain enough public technical information to identify accurately the principle of operation of the collection sources. However, the impression that was reached is possibly a lot close to reality.

Given the perception of the principles of operation of the collection tool, this is a very effective device and mainly nonintrusive, given that it does not interfere with the interactions and neither does it require from the participants a separate record of their ideas and assertions. In the end, what is left is an unstructured base of informations with ideas, insights, findings, interpretations and refinements, among many other forms of interactions between people involved in the environmental analysis, all duly contextualized by a very potent ontology-based technological device.

The following instrument, responsible for analysis of data and unstructured information, makes use of the repository formed to aid the strategies analyst to extract the input needed to develop and mature the ideas, through the generating and discovery of knowledges, converting them into visions that, once formatted, become strategic guidelines and, when developed and matured, in a second moment, turn into

strategic objectives that compose the new strategic map of the company.

There are more acute cases in which the analyses trigger more profound changes, affecting even the mission, vision and strategic principles of the company. In other more rare cases, the company's own business undergoes changes. The reflections in the business plan and/or the business model or models are sometimes unavoidable, causing, as it should be, changes. One thing that caught the attention of the researchers was the fact that the tool employs the natural language as communications interface.

Fact is that everything takes place in the mind of the analyst or analysts acting on the formed base, in obvious generated tacit knowledge, confirming the underlying axiom that knowledge is exclusively the result of the human mind. It is in this moment, as a rule, concomitant with the analyses, that the third tool is used, that is, the one for evidencing knowledges.

This tool allows the analyst to edit multimedia documents containing the statements of the participants of the induced thematic environment analysis, which carry the strategic changes that, once approved, are used during the development of strategies, measurement indicators (board indicators or business scorecard) and action plans. Such plans, when applied, institutionalize new culture in the company, causing the desired change, in order to better adapt to the new business environment.

The recursion of the tool was observed to the extent that the evidenced knowledge is also stored and contextualized as unstructured information, becoming available as source for further analyses, demonstrating its reuse. A subtle distinction was observed by researchers, namely, for the tool there is distinction between the sharing and dissemination of knowledge. The first is when the user shares the access to the produced knowledge with other users, keeping it, however, exclusively under the control and management of the tool. The second is when the user generates a CD or DVD that materializes the evidenced document, being that, in this case, the tool loses control of the document.

As a result of the research, it was registered that ICTs are not intrusive in the process of idea gathering. It is also indisputable the role of ICTs in assisting the production of the knowledges generated throughout the chain that result in the strategies that trigger organizational learning, as well as the monitoring of its institutionalization through tracking the indicators built to measure conversion of strategy into corporate culture.

Another result was the perception of the strategy as knowledge included in the organizational level. It must also be mentioned the fact that the ICTs in no way assist the creativity of individuals during the idea generation process. This, as it can be noted, is a process only performed by the human mind. Finally, it is obvious that ICTs significantly assist in knowledge management, the latter understood as an autonomous entity, i.e., an intangible asset.

## 5. FINAL THOUGHTS

The research orbited the theme of the methods and techniques used in knowledge management, limiting its scope in the search for evidences indicating the role of ICTs in the collecting of ideas and organizational learning. The individualized perception of the researchers, followed by dialogue that reached the intended consensual perception were adopted as a method for obtaining such evidence.

The results show that ICTs serve as instruments for assisted production of knowledge and that such knowledges, when formalized into strategies, trigger, if used and applied, organizational learning, leading to a cultural change in the company, adjusting it to the business environment in which it operates.

The theoretical contribution of this research is spotted in the description as to how the ICTs applied in tools of digital intelligence assist in the collecting of ideas, in the generating and discovery of knowledge from unstructured analysis and in measurement of the effectiveness of the application of this knowledge through the monitoring of indicators, all in the context of organizational learning. Although it was not the object of this research, it is possible to observe that the tool is also capable of monitoring the business environments regarding the variables that define them, through structured/graphical analysis.

The group comprehended that the necessary knowledge to organizational learning is explicit and inhabits the organization level; that development and maturing of ideas require existing knowledge, especially tacit that inhabits individuals; that the result of development and maturing of an idea is the vision of the culture already internalized; and that the materialization of the vision requires the generating of new knowledge, whereby this, once applied, converts into competence, transforming the new knowledge into existing knowledge, i.e., the knowledge only comes into existence when applied to a specific case.

Another conclusion is that the current culture may influence the generating of ideas that aim to change it and, for that, aiding creativity is a *conditio sine qua non* for reaching full organizational learning. It is noted that the current culture has direct influence on the perception of the individual during the process of analysis and thematic discussion of the business environment variables.

It is recommended to the conductors of the organizational learning process to:

- Break cultural barriers through the creation of environments that aid creativity;
- Constantly monitor the business environments in which companies are immersed;
- Foster the creation of multidisciplinary teams that carry constant thematic analysis of the environments through groups and discussion forums and voice and chat conferences;
- Frequently analyze the given statements, extracting the ideas and stimulating its development and maturing, through the same

mechanisms, until the content is comprehended;

- Analyze the obtained insights, generating knowledges and evidencing them in the form of new strategies to be institutionalized and converted into new culture that adapts the company, adjusting the latter to the business environments.

Such actions constitute what researchers believe to be a cycle of organizational learning, which, if assisted by technological tools of digital intelligence, have great chances of maintaining the survival of companies and promoting their growth.

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