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Convergences between Social Exchange Theory and mediation of information and knowledge from the perspective of software developers a case study

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ABSTRACT

Information and knowledge are essential for the survival of companies and people's daily lives. Furthermore, software is a fundamental element to manage this information. Programming professionals use information and organizational knowledge to develop their projects and work as a team. Information and knowledge represent power, and their sharing includes bargains, behaviors studied by the Social Exchange Theory. Sharing information effectively involves more than passing it on, it involves interference aiming the receiver's appropriation of it, for work execution, by means of information mediating subjects. This paper objective is to verify how information and knowledge are shared among software professionals, inferring how principles of Social Exchange Theory interfere or not in their mediation, highlighting the influence of egocentric and altruistic motivators, or motivation aimed at the group. As methodological procedures, a descriptive case study was carried out with software professionals, students of a public higher education institution, in Garça city, São Paulo state, as well as their administrative personnel, using questionnaires, interviews and analysis of the institution website. As a result, it was found that there is evidence of mediation of information and knowledge among those surveyed, since altruistic and egocentric motivations are dialectically reconciled in this mediation/sharing. The results are attributed possibly to internalized values during higher education period, as well to a psychologically positive work environment. It is concluded that there are convergences between the Social Exchange Theory and the mediation of information, both in theoretical and practical aspects, showing the possibility of mediation besides traditional informational equipment: libraries, archives and museums.

KEYWORDS

Programming. Information mediators. Organizational knowledge.

Convergências entre a Teoria da Troca Social e a mediação da informação e do conhecimento na perspectiva dos desenvolvedores de *software* um estudo de caso

RESUMO

Informação e conhecimento são imprescindíveis à sobrevivência das empresas e no cotidiano das pessoas. Ademais, o *software* é elemento fundamental para gerir essas informações. Os profissionais de programação fazem uso de informação e conhecimento organizacional para desenvolverem seus projetos e trabalharem em equipe. Informação e conhecimento representam poder, e seu compartilhamento inclui barganhas, comportamentos estudados pela Teoria da Troca Social. Compartilhar informação efetivamente envolve mais do que repassá-la, envolve uma interferência visando que o receptor faça sua apropriação, para a execução do trabalho, por meio de sujeitos mediadores da informação. Objetiva-se verificar como se dá o compartilhamento de informação e conhecimento entre profissionais de *software*, inferindo como princípios da Teoria da Troca Social interferem ou em sua mediação, destacando a influência de motivadores egocêntricos e altruístas, ou voltados à coletividade. Como procedimentos metodológicos, efetuou-se um estudo de caso, de natureza descritiva, com profissionais de *software* discentes de uma instituição pública de ensino superior, de Garça, São Paulo, bem como seus funcionários administrativos, utilizando questionários, entrevistas e análise do *site* da instituição. Como resultados, verificou-se existirem evidências de mediação da informação e conhecimento entre os pesquisados, sendo que motivações altruístas e egocêntricas se conciliam dialeticamente nessa /mediação/compartilhamento. Atribui-se os resultados possivelmente a valores internalizados na formação universitária e a um ambiente de trabalho psicologicamente positivo. Conclui-se que existem convergências entre a Teoria da Troca Social e a mediação da informação, tanto no aspecto teórico quanto prático, evidenciando a possibilidade da mediação além dos equipamentos informacionais tradicionais: bibliotecas, arquivos e museus.

PALAVRAS-CHAVE

Programação. Mediadores da informação. Conhecimento organizacional.



JITA: GD. Organizations

1 INTRODUCTION

Information and Communication Technologies (ICT) have become the cornerstone of modern life, in which a constant and accelerated flow of information is an indispensable requirement for the survival of practically all types of organizations. The software field has significant relevance in the economic aspect in general. According to the Associação Brasileira das Empresas de Software (2020), this sector moved about 44.3 billion U.S. dollars in Brazil in 2019, and this year the growth of the sector nationally even exceeded the world average.

The interaction of human beings with the technological devices takes place through software, which are sets of instructions in programming language that determine how various types of devices should receive, process, store and display information. Software, commonly, has a complex structure, consisting of several layers of functionalities and interdependent modules, which are created and maintained by teams of professionals from various specialty fields (SOUZA, 2019). The programming activity, therefore, requires expertise and creativity, requiring the creation, use and constant sharing of information and knowledge, so that the team of developers can work cohesively (SOMMERVILLE, 2007).

Knowledge is inextricably human, elaborated in the mind of the individual, in an amalgamation of his past experiences with information acquired by him, along with his values and worldview. This knowledge, while remaining a personal experience, is characterized as a rich, complex and subjective element, which is difficult to express directly to others, being characterized as tacit (TAKEUCHI; NONAKA, 2008). This tacit knowledge can also be codified, expressed in words or symbols, in its explicit form, or, as defined by Buckland (1991), knowledge-as-information. The relationship between information and knowledge, therefore, is intimate and the transformations between these two elements, the conversion of one into another, is a cyclical process.

As already mentioned, to work as a team, it is necessary to share information and knowledge. However, there are two main aspects that can make this sharing difficult. First, as already discussed, knowledge in tacit form is personal, and there is the need for its holder to effectively share it. Second, explicit knowledge, converted into information, may represent power and prestige for its holder in the organizational context (PÉREZ-MONTORO-GUTIÉRREZ, 2008). Therefore, it is a complex task to try to understand what factors and motivations can lead subjects to give precious knowledge and information to other people. In this aspect, the Social Exchange Theory (SET) can help in understanding this complex phenomenon.

SET describes the behavioral interactions between two or more individuals and how these behavioral interactions reinforce the other's behavior. Both actors would exchange with one another on the belief that the exchange would produce benefits for both (ZOLLER; GARLAND; MULDON, 2019. p. 50).

SET uses contributions from Sociology, Economics, Psychology and other areas to explain the mechanisms of benefit exchange between people who do not involve monetary transactions, motivated by long-term relationships and/or social norms. Moreover, one can also classify the motivating factors of SET between egocentric motivations, aimed at direct reciprocity to the subject who provides any benefits to others (CROPANZANO; MITCHELL, 2005; GIFT EXCHANGE, 2020; ZOLLER; GARLAND; MULDON, 2019), as well as altruistic and collective well-being motivations (FOA; FOA, 1974, 1980 apud CROPANZANO; MITCHELL, 2005; LAWLER; TYE, 1999; TSAI; CHENG, 2011; CHESHIRE, 2020).

This research is justified by the fact pointed out by Hall (2003), that researches in Information Science on the sharing of information and knowledge are generally based on empirical results, without a more solid theoretical basis to explain the deep meaning of this sharing. It is emphasized that this author (2003) explicitly recommends the use of SET to confer greater consistency in research on the mentioned theme. SET studies the relations of exchange since long ago, following the example of the important research on the exchange of gifts in primitive societies, carried out by the sociologist and anthropologist Marcel Mauss, in the 1920s (GIFT EXCHANGE, 2020). Taking advantage of these theoretical contributions makes possible a "[...] deeper understanding of the phenomena, without recreating concepts from scratch, allowing a more consistent advance in research" (MORAES; SOUZA, 2019, our translation).

In this regard, the subject who shares information and knowledge acts as its mediator. The mediation of information is a process of interference over information, in a direct/explicit, or indirect/implicit way, which aims that other subject(s) can realize the effective appropriation, or understanding, of this information (ALMEIDA JÚNIOR, 2015). For mediation to occur, therefore, it is necessary that the mediator has the genuine interest that the recipient of the information be able to appropriate it, representing an act in favor of the autonomy and empowerment of the other, an act of care (GOMES, 2014).

Therefore, and according to the exposed problem, the research problems focus on the following questions: what are the main motivations that lead software professionals to share information and knowledge with their coworkers? Is there any concern on their part that their colleagues make the effective appropriation of information? Is there evidence of information mediation among software developers? In view of these questions, the general objective of this research is to verify how information and knowledge is shared among software professionals, from the perspective of SET. It is also sought to identify how motivational principles, both towards collectivity and altruism, and towards direct reciprocity/egocentrism, collaborate or not for the effective mediation of information in this field. In order to achieve the proposed objectives, a quali-quantitative research was carried out unveiling the perspective of software developers regarding the problem already addressed, having as context a public institution of higher education in which these workers are students. This institution welcomes students from various municipalities in the region of Marília, São Paulo, with a relevant socioeconomic impact.

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2 LITERATURE REVIEW

Developing software is an intensive work not only in the use of information and knowledge, but also in human interaction (SOUZA, 2019). The sequence of steps to produce software is called software process. Although there are a myriad of different methodologies to create software, they all share a core of common activities: raising software features and functionalities with the client; planning the software structure; implementing it using programming languages; performing tests; making adjustments and corrections over time (SOMMERVILLE, 2007). As stated by Souza (2019), in this process the following are exchanged: registered information/explicit knowledge through project documentation among the development team; experiences in the form of tacit knowledge also among development team members; tacit knowledge about business rules between developers and clients.

For Park, Lee and Lee (2015), sharing information and knowledge is vital to the success of a software project, including greatly reducing the time required to solve problems. In addition, the flow of information and knowledge is essential to integrate in a harmonious way

the activities of professionals of various functions/training who work on specific aspects of the software structure.

IS projects need intensive knowledge contributions from professionals with different expertise. A variety of business field knowledge needs to be integrated and converged with a variety of technological knowledge in order to build appropriate information systems. These experts may reside in different parts of the organization or in different organizations intensifying the problem of knowledge sharing (PARK; LEE; LEE, 2015, p. 194).

Since knowledge and information are precious resources, and can represent personal advantages for their holders, it is necessary to understand which factors could stimulate subjects to share with others. It is argued that SET can provide satisfactory explanations in this respect.

Initially, it is relevant to emphasize that the relations of exchange of benefits in the context of SET can happen from one subject to another, as well as from the subject to the group in which he is inserted. The mechanisms of SET do not involve cash transactions, as already mentioned. The basic principle of SET can be better understood when analyzing the ceremonial practices of gift exchange in primitive societies. The exchange of gifts refers to the exchange of goods or services between subjects on a voluntary basis, in religious rituals or ceremonies, as part of expected social behavior, reaffirming a prior relationship between the parties or as a way of starting a relationship, having as balance the prestige, instead of material advantages (GIFT EXCHANGE, 2020). A fundamental aspect of this practice is the need for reciprocity in exchanges, as a symbol of friendship, so that a good relationship can be maintained.

The gift-exchange cycle entails obligations to give, to receive and to return. Sanctions may exist to induce people to give, disapproval or loss of prestige resulting from a failure to do so. Refusal to accept gift may be seen as refusal of social relations and may lead to enmity. The reciprocity of the cycle rests in the obligation to return the gift; the prestige associated with the appearance of generosity dictates that the value of the return be approximately equal to or greater than the value of the original gift (GIFT EXCHANGE, 2020).

Therefore, it is agreed in this research to name the motivators of the SET focused on direct reciprocity, aiming at immediate personal benefits, of self-centered motivations. However, human relations are not always built based on the interest for direct retribution.

On several occasions people prove their resources or efforts for the benefit of their group, or even strangers, without there being any clear prospect of retribution. The theory of generalized exchange can illuminate the reasons for this type of behavior. This type of SET can occur between organizations, nations, social groups, even among people who do not know each other, and those who provide the benefit are aware that direct reciprocity may not be possible (CHESHIRE, 2020). This is a kind of altruistic behavior, in which the subject may have the expectation that by doing something good to someone, when they need it, someone can also do something for them. As Cheshire (2020) states, a fairly common form of generalized exchange occurs when subjects make collaborations for the common or public good, also called group-focused exchange, in which everyone benefits.

Regarding to SET itself, the exchange relationships within it are made up of three basic elements: rules/rules; resources exchanged; relationship between the parties involved (CROPANZANO; MITCHELL, 2005). Regarding the relationship, within SET, it must be based on long-term interactions, which result in solid bonds of trust and commitment among the subjects (CROPANZANO; MITCHELL, 2005). This statement can be confirmed in the sense that several authors assert that, precisely because knowledge is a precious and personal element, when it comes to the tacit side, especially when it comes to trusting the person with whom one shares, that this person will not take advantage of the knowledge in an improper

manner and/or harm others (MARCHAND; KETTINGER; ROLLINS, 2001; SOUZA, 2019; TAKEUCHI, NONAKA, 2008). This trust takes time to build, as subjects get to know each other's behavior and values.

The rules of exchange can be based on reciprocity as well as on negotiated agreements. For Cropanzano and Mitchell (2005), a greater or lesser tendency to reciprocity has to do with both the psychological characteristics of the subject and his culture, and the existence of reciprocity is also possible due to negative acts received, the latter being inhibited by the subject's moral/religious beliefs, or in a 'law of return' intrinsic to reality. One can thus infer the possible impact of internalized moral/religious principles when the subject grants a benefit to another without expecting direct reciprocity, or even any reciprocity. For example, Cheshire (2020) states that in primitive societies sacrifices, gifts, and libations were seen as gifts by those who expected to receive favors from the gods. Thus, acts of kindness are still seen as a way of earning God's favor in modern religions.

Still on the subject of reciprocity, and the interactions between subjects, these often determine that the exchange of knowledge and information works almost like a buying and selling transaction. Pérez-Montoro-Gutiérrez (2008) says that in organizations there is a 'knowledge market' in which: knowledge would be the 'commodity'; the sharers, their 'sellers'; the managers, the intermediaries; reciprocity and the good reputation that the sharer can gain, the 'price' of his knowledge. For Pérez-Montoro-Gutiérrez (2008), knowledge transactions would be under the same economic laws that govern real markets, such as supply and demand, among others. However, as will be discussed later in this section, knowledge interactions are not always motivated only by personal gain.

Finally, it is necessary to talk about the agreements, or rules, negotiated. These have a more formal character than the simple exchange of kindness between friends or coworkers, being even closer to financial transactions, in the sense that the terms and 'values' of the exchanged items are described in more detail, sometimes even settled contractually (CROPANZANO; MITCHELL, 2005). This perspective, however, differs from that of knowledge markets, presented above, in the sense that in the market for organizational knowledge there is no formal definition of the 'price' of one's knowledge nor detailed agreements; the 'value' is given subjectively and tacitly.

The nature of the items that can be exchanged in the context of SET is quite broad, ranging from physical to abstract elements. The items exchanged, affirm Foa and Foa (1974, 1980 *apud* CROPANZANO; MITCHELL, 2005) can be, for example: information, love, status, goods or services.

It is reiterated that, for Pérez-Montoro-Gutiérrez (2008), the knowledge exchanged in the organization has a symbolic 'price', which can be constituted in two main categories: reciprocity and reputation. The theme of reciprocity has already been discussed in this paper. It is hoped, therefore, that the person who shares his or her knowledge will be able to give preference to those who are more able to pay him or her for valuable knowledge in the future (PÉREZ-MONTORO-GUTIÉRREZ, 2008). Maintaining a good reputation in the group is also another common motivator to give up knowledge.

On the one hand, in a positive sense, there is the expectation that by giving it away, other people will recognize it (acquire the reputation) doubly, as a possessor of valuable knowledge and as an individual who shows a positive disposition to share it for the good of the organization. And on the other hand, in a negative sense, one has the perception that not sharing [...] can create a bad image of him within the organization (PÉREZ-MONTORO-GUTIÉRREZ, 2008, p. 101, our translation).

However, as already discussed in this section, not only reputation and reciprocity can be exchanged in a SET relationship, but also love, friendship and the like. In other words, it is

inferred that a subject can give knowledge and information to someone who may not be in a position to reciprocate, either because he seeks his friendship, his companionship, or because he feels some moral impulse to help his neighbor. Extending this reasoning, one ponders that: "Be two lovers who share a warm and mutual affection or two companies that pool resources to generate a new product, the basic form of interaction remains the same" (LAWLER; TYE, 1999, p. 217, our translation).

There is one more aspect to be considered in relation to the willingness to share information and knowledge, which is to rely on one's own ability to generate/share these items: self-efficacy. Self-efficacy is defined as an individual's confidence in his/her own ability to be successful in performing behaviors that lead to intended results (BANDURA, 1978). The perception of one's own cognitive capacity becomes a motivator in the interaction with other people, aiming at the sharing/mediation of intellectual resources.

Users with a high level of self-efficacy will feel that they are competent to share, contribute and exchange their knowledge in a community, and then their willingness to browse the content of the community for preparing social interactions with other members may be increased. Therefore, their participation behaviors are likely to be gradually promoted. (BAO; HAN, 2019, p. 642).

It can be inferred from the above that the subject can enjoy a certain pleasure in demonstrating his ability to others, or just exercise his cognitive skills, as in the case of those who entertain themselves with any intellectually stimulating game/diverse.

So far, personal gains concerning SET have been discussed. However, the exchanges can also be carried out aiming at gains for the group. As already mentioned in this section, the generalized exchange occurs when the subject provides a benefit not to a specific person, but to the whole collectivity of which he is part. It is argued that this modality of SET is especially relevant because it allows knowledge and information to be disseminated throughout the organization, contributing to the achievement of its objectives. For Tsai and Cheng (2011), employees feel willing to share their knowledge on behalf of the organization when they feel that it acts fairly with them. Furthermore, Souza e Moraes (2018) concludes that when the organization is interested in the well-being of its employees, an environment where satisfaction and a positive organizational climate are in place, that is, a psychological atmosphere favorable to the sharing of knowledge. Therefore, it is inferred that the organizational climate is an important motivational element.

The concept of organizational climate represents the broadest picture of environmental influence on motivation. Organizational climate is the quality or property of the organizational environment that is perceived or experienced by the participants of the organization and that influences their behavior (CHIAVENATO, 2003, P. 539, our translation).

In the context of SET, it is as if there was a reciprocity between employee and company, in the exchange of mutual benefits. "In addition, an employee who is more committed to the organization, and has more trust in both management and co-workers, is more likely to share their knowledge" (TSAI; CHENG, 2011, p. 1076).

The emotional aspect is quite relevant when considering interactions in the context of SET. Appreciation, friendship and the habit of caring for co-workers who need help is a natural impulse in human beings and is also reflected in the organizational context (CROPANZANO; MITCHELL, 2005; ZOLLER; GARLAND, 2019). Mediation of information is also an act of care and appreciation, because the mediator needs to do more than just pass on information, but make sure that it is useful to the recipient and that there are conditions in which he/she can effectively understand it.

If the mediating action is an action linked to movement and life, considering that the subjects who need information, and with whom information professionals interact, need to feel welcomed, need to develop a sense of belonging to the information environment, then it must be admitted that the information mediator is an agent involved in the act of caring (GOMES, 2014, p. 53, our translation).

Mediate information and knowledge can be seen as an act of appreciation for one another. In addition to the more concrete personal gains that this activity can result in, it can also be carried out aiming at emotional gains, given the intrinsic need of every human being for affection and recognition, which can be obtained from the other, to whom the information is mediated. This makes it possible for someone to mediate information apparently without asking anything in return, while yearning for the psychological benefits of helping others.

Therefore, through the literature review and the discussions presented in this section, one can summarize the main motivational elements of SET involved in sharing and mediating information and knowledge. They are: direct personal benefits (direct reciprocity); collective and indirect benefits (generalized exchange, resulting from the positive organizational climate); emotional benefits (friendship, companionship, love and the like); intellectual pleasure / exercise of self-efficacy.

Besides the positive aspects of collaboration between organizational subjects, considered by SET, it is necessary to clarify that there are, in the organizational scope, negative behaviors that hinder both the sharing and mediation of information and knowledge. It is reiterated that the way the employee is treated by the company and the level at which it meets their physical and psychosocial needs, constituting the organizational climate, already addressed in this section, influences the motivation of employees. The dissatisfaction of these needs causes what is called low organizational morale, whose implications, among others, are: "[...] attitudes of disinterest, denial, rejection, pessimism and apathy towards work, as well as problems of supervision and discipline" (CHIAVENATO, 2003, p. 120, our translation). Following the inverse logic of SET principles, it is inferred that if the subject is motivated to collaborate with the organization by providing information and knowledge in return for good treatment received (TSAI; CHENG, 2011), the demonstration of disinterest of the company in the needs of the employee is paid with the apathy of the employee.

Other factors related to negative organizational morale and climate can act as obstacles in sharing information, such as distrust of coworkers and the monopolization of information as a way to achieve career success (DAVENPORT; PRUSAK, 1998). The monopoly of information and knowledge can be a strategy of defense of the subject regarding uncertainties about his stability in the company, as Terrett (1998) discusses, in relation to law professionals:

This obsession with information hoarding reaches its logical conclusion when the lawyer believes that a monopoly on particular information will lead to personal indispensability within the firm – an insurance policy against redundancy. This understandable, yet wholly irrational belief is completed unfounded (p. 68).

Although there are these factors that hinder the sharing and potential mediation of information and knowledge, the collaborative and interfunctional nature of software development activity requires a minimum of sharing so that professionals can integrate the different modules/software layers they are responsible for to obtain a functional product (SOMMERVILLE, 2007; SOUZA, 2019). As an analogy, it is inferred that the graphic interface created by the professional 'A' needs to be satisfactorily integrated to the functional layer created by the professional 'B', which must be correctly coupled to the database prepared by the professional 'C'. Otherwise, the developed system will not be able to perform the tasks required. Assuming that there must be some kind of information and knowledge sharing in this professional niche, the question is to verify the level of quality/effectiveness of this sharing,

enabling the effective execution of the work. It is argued that evidence of possible information and knowledge mediation behaviors can work as indicators of this quality and effectiveness, since mediation involves more than passing on information, but sharing the adequate information for the effective satisfaction of the subject's needs, making sure that he is able to understand it, appropriate it.

3 METHODOLOGICAL PROCEDURES

This research is characterized as basic, exploratory-descriptive (GIL, 2008), because it aims to describe the characteristics of the phenomena of information and knowledge sharing, and their possible mediation, in a given population, exposing characteristics of the educational environment that forged the values/practices of these professionals. In addition, it establishes the relationship between the types of SET behaviors and the possible mediation of information and knowledge among the researched subjects.

Furthermore, it adopts as research method the unique case study with quali-quantitative approach. For Yin (2009), case studies are an ideal research modality to investigate complex social phenomena, based on the investigation of a few units of analysis, but in a certain degree of depth, by crossing various sources of evidence. The generalization of results, in this case, is not based on quantitative criteria, but is analytical, checking the convergence of data collected from the units of analysis with each other and with the previous literature, aiming at deepening or expanding theoretical contributions (YIN, 2009). This is a paradigm of thought distinct from the positivist, for which the validation of the research is given mainly by statistical representativeness.

The research universe is composed of software developers and the locus is represented by a higher education institution from the interior of São Paulo. The Faculty of Garça Technology (FATEC-Garça) was defined as one of the few public institutions of higher education to offer a course in the area of computing in the region of Marília, São Paulo. The region of Marília is strategic for housing one of the five Local Productive Arrangements of Information Technology (APL-TI) in the state (APL-TI MARÍLIA, 2018). The educational institution considered has about 1,200 students, including the day and night periods.

Besides the strategic importance for the region of Marília, the choice of the aforementioned locus is justified by the possibility of having access to students who are employees of several organizations, from different municipalities, in the same physical space. The approach in the university environment allowed a direct contact with the researched, to explain in more detail the theme and the objectives of the research. It is emphasized that FATECs do not have, according to information from the administrative staff of the Garça campus, an ethics committee to deal with specific academic research issues. However, it is justified that this research did not deal with human groups in vulnerable conditions, nor did it involve any procedures that could represent physical, psychological or moral harm to participants. Furthermore, the participants agreed to a Term of Free and Informed Consent (TCLE), ensuring confidentiality of their personal data, highlighting the voluntary nature of their collaboration.

The data collection techniques were based on the questionnaire, interview and documentary research from March to August 2020. Initially, the questionnaires were distributed to professional software developers, who are also university students at FATEC-Garça. The first stage of the collection, the application of the questionnaires, took place in person in early March 2020, at a time when the COVID-19 pandemic was not in such a critical state in Brazil and there were no specific health restrictions. This allowed a brief

interaction between researcher and researchers in order to expose the research topic and its relevance. The selection criteria for the intentional sample of the target population of the research were two: to work currently with software development, either as a staff member or trainee, and to be willing to participate voluntarily in the study. Thus, students from all six terms¹ of the night period of the Technology in Systems Analysis and Development (SAD) course were approached, selecting 12 students according to the defined sampling criteria.

The content of the questionnaire was elaborated by means of the theoretical reference of the present research, when it converged with the elements to be investigated, such as: egocentric and collective/altruistic aspects of SET (BAO; HAN, 2019; CHESHIRE, 2020; CROPANZANO; MITCHELL, 2005; PARK; LEE, 1999; TSAI; CHENG, 2011; ZOLLER; GARLAND; MULDON, 2019); information mediation (ALMEIDA JÚNIOR, 2015; BORTOLIN; LOPES, 2016; GOMES, 2014); knowledge management (PÉREZ-MONTORO-GUTIÉRREZ, 2008; TAKEUCHI, NONAKA, 2008). An online questionnaire using Likert scale was sent by e-mail to infer their attitudes and opinions about the sharing and mediation of information in the work context. The questionnaires were sent to the participants' personal email to answer when and where they wanted, ensuring privacy and minimizing possible external pressures on the answers.

The second stage of data collection, the semi-structured interview, was carried out with administrative and management staff of FATEC Garça, in order to ascertain the criteria of representativeness of the analysis unit, its relevance in the regional economic/business context, as well as the characteristics of the student body. It is clarified that the interviews were conducted in August 2020 and, due to the critical moment of the coronavirus pandemic in Brazil, and the health restrictions imposed by the educational institution, they were conducted virtually through the application of WhatsApp messages.

The third stage of the collection, the documentary research, was carried out at the institution's website in order to recover information related to the SAD course, especially regarding the curricular matrix, the values that are sought to instill in the students and skills that are sought to develop.

In this way, it was possible to perform the triangulation of data. It is also important to highlight some issues related to measures to ensure some level of consistency in the data collected. Regarding the truthfulness of the answers of the researchers, it is important to point out that, as Laville and Dionne (1999) affirm, Human and Social Sciences deal with people, who have free will, particular values and a peculiar way of seeing reality. Since human facts are complex and variable according to times, cultures and circumstances, it is impossible to measure them with the precision of the laws of Mathematics and Natural Sciences, since the subjectivity of the researcher and those researched can influence the results (LAVILLE; DIONNE, 1999). Still according to these authors, the 'truth' in Human Sciences is relative and provisional. Thus, it cannot be guaranteed that the subjects researched are completely sincere, but some strategies can be used to guarantee a minimum of coherence in the research results.

The truthfulness of the results was sought by ensuring anonymity in the responses of those surveyed, in addition to the researcher providing instructions on the importance of the responses representing the real thoughts of the respondents, with no need for 'politically correct' responses.

As for the analysis and interpretation of the results, the percentages of each chosen alternative were computed in relation to the questions in the questionnaire, and these calculations were then represented by means of tables and graphs. The interview was

¹At FATEC, the term is the period of one semester, after which the student must resubscribe. The technological courses offered by the institution have a duration of six terms, or three years.

transcribed and its main points summarized and displayed in textual form, as well as the results of the documentary research on the institution's *website*.

4 RESULTS AND DISCUSSION

Initially, it is necessary to verify the representativeness of the unit of analysis and the subjects researched, to ensure the consistency of the case study performed. According to the director of the educational institution and administrative staff interviewed, among the approximately 1,200 students, 138 are from the SAD course in the morning and 291 from the SAD course at night. As mentioned, the institution is the only public college to offer a computer course in the region and, for this reason, FATEC attracts students from several cities in the region, for the teaching of excellence, which unites scientific rigor with an orientation to the world of work, as well as for the qualified teaching staff. In the SAD course, specifically, students from the cities of Marília, Vera Cruz, Garça, Duartina are present, besides the districts of Júlio Mesquita and Jafa. It is reiterated that the region of Marília is important in the sector of information technology for having one of the five Local Productive Arrangements of Information Technology of the State of São Paulo (APL-TI MARÍLIA, 2018). Furthermore, according to the director, FATEC-Garça's students and graduates have a substantial impact on the region's economic and business contexts, due to their good level of employability and also due to their tendency towards entrepreneurship.

Specifically, in relation to teaching, besides the technological part itself, students receive knowledge about organizational behavior and dynamics, emphasizing the importance of teamwork through the sharing of information and knowledge. The participation of students in lectures, fairs and extension courses focused on people management and leadership is supported, as well as in the curricular matrix there are disciplines focused on this area: Team Management, Entrepreneurship and Administration Theory.

This type of teaching is in line with the objectives of the course, expressed on the online page of the institution. It seeks to train professionals who, besides designing, developing and maintaining software systems are also "[...] versatile, dynamic, who know how to work in teams and can have contact with the end user of the system" (GUARANTEE TECHNOLOGY FACULTY, 2020). Thus, it is important to infer whether these humanistic values are in fact incorporated by students, how this impacts on their willingness to share information and/or perform their mediation. The following is a compilation of the answers to the questionnaire that addresses this theme.

4.1 Self-centered and altruistic factors involved in information and knowledge sharing

Regarding the questionnaires, their initial part is about the profile of companies and respondents. It was found that the surveyed software development professionals work in companies of several niches, such as: software for transit services; business software; e-commerce and marketing; monitoring and tracking; food industry. Regarding the positions of the respondents, 07 are effective professionals and 05 are trainees. Among the effective professionals: 02 are support analysts and 05 programmers. Regarding the trainees, 4 work with programming and 01 works in the innovation area. According to the time they work in software development, 08 respondents (66.7%) have been working for less than 01 year, while 04 (33.3%) work for 01 to 5 years.

The second part of the questionnaire sought to infer the motivation of professionals to share information with coworkers. It was proposed a scale of ordinal values of level of

agreement for the questions: 4] I fully agree; [3] I partially agree; [2] I neither agree nor disagree; [1] I partially disagree; [0] I fully disagree. Therefore, Table 1 shows the motivations for sharing information based on SET principles for retribution that benefits the information and knowledge sharer, or potential mediator, called egocentric in this research.

Table 1. Self-centered motivations and reciprocity in sharing information and knowledge.

Affirmative	Scale					Σ
	4	3	2	1	0	
1. I share information and knowledge to maintain a good reputation and/or status among my coworker.	07 [58,3%]	02 [16,7%]	00 [0,0%]	02 [16,7%]	01 [8,3%]	12 [100,0%]
2. I share information and knowledge because I hope the person I shared it with will do the same for me, as an exchange of favors	04 [33,3%]	04 [33,3%]	02 [16,7%]	02 [16,7%]	00 [0,0%]	12 [100,0%]
3. I share information and knowledge because I believe it can help me grow in my career.	09 [75%]	02 [16,7%]	00 [0%]	01 [8,3%]	00 [0%]	12 [100%]
4. I share information and knowledge because those who do not do it are not well seen by their coworkers.	03 [25%]	00 [0%]	05 [41,7%]	03 [25%]	01 [8,3%]	12 [100%]
5. I share information and knowledge simply because it is my obligation	00 [0%]	03 [25%]	03 [25%]	03 [25%]	03 [25%]	12 [100%]

Legend: scale - [4] I fully agree; [3] I partially agree; [2] I neither agree nor disagree; [1] I partially disagree; [0] I fully disagree

Source: Elaborated by the authors (2020).

The motivations for the exchange of information and, analogously, of knowledge, can be divided between the most altruistic and the most self-centered. In accordance with Pérez-Montoro-Gutiérrez (2008)'s statement that people give knowledge and information in order to maintain a good reputation, in question 1 it was found that 58.3% of respondents, the majority, fully agree with that view, while only 8.3%, the minority, fully disagree. No respondent chose the neutral alternative, 'I neither agree nor disagree', showing a clear tendency towards total agreement.

Regarding the principle of reciprocity of SET (CROPANZANO; MITCHELL, 2005; GIFT EXCHANGE, 2020; ZOLLER; GARLAND; MULDON, 2019), question 2 asked whether respondents would view the exchange of information and knowledge as an exchange of favors, expecting a direct return in the future. Respondents were more divided on the question, but with a slightly greater tendency to agree. 33.3% agreed fully and partially; 16.7% gave a neutral response. 16.7% disagreed partially. There were no full disagreements.

In question 3, when asked if the respondents share information/knowledge aiming at career growth, which would also be a form of direct reciprocity, the overwhelming majority, 75%, fully agreed, with no neutral answers and no full disagreements, only 8% who partially disagreed. This question is based on the fact established by Pérez-Montoro-Gutiérrez (2008, p. 101, our translation) that one of the consequences (reciprocity) expected by the subject who shares knowledge may be "[...] job security, personal promotion or salary increase [...]", a consequence of the good reputation he enjoys as a sharer.

In question 4, according to the conclusions of Pérez-Montoro-Gutiérrez (2008), it was questioned whether avoiding being misunderstood by coworkers would be a motivator to

exchange knowledge and information. There was a preponderance of neutral responses (41.7%), and also a greater tendency for negative responses.

Finally, in question 5, when asked if they would share information and knowledge simply because it was their duty, the respondents were very divided, and no greater tendency for positive or negative responses could be identified, showing that there is no consensus about it.

Table 2 emphasizes the more altruistic motivations and those based on generalized exchange, in which the subject does not necessarily expect an immediate and direct return, but performs the 'good deed' for the benefit of the collectivity, which can also benefit them, but indirectly, as a member of the group (CHESHIRE, 2020; TSAI; CHENG, 2011).

Table 2 - group/altruistic motivations in sharing information and knowledge.

Affirmative	Scale					Σ
	4	3	2	1	0	
6. I share information and knowledge because in my company everyone helps each other and in the future someone can share information with me when I need it.	08 [66,7%]	03 [25%]	01 [8,3%]	00 [0%]	00 [0%]	12 [100,0%]
7. I share information and knowledge because I feel personal satisfaction, pleasure, in sharing with others whom I know	07 [58,3%]	04 [33,3%]	01 [8,3%]	00 [0%]	00 [0%]	12 [100,0%]
8. I share information and knowledge with people I have a friendship with, whether or not they receive something in return.	09 [75%]	02 [16,7%]	01 [8,3%]	00 [0%]	00 [0%]	12 [100%]

Legend: scale - [4] I fully agree; [3] I partially agree; [2] I neither agree nor disagree; [1] I partially disagree; [0] I fully disagree

Source: Elaborated by the authors (2020).

In question 6, which specifically addresses general exchange, most respondents were positive in stating that "I share information and knowledge because in my company everyone helps each other and in the future someone can share information with me when I need it". Thus, 66.7% fully agreed with this proposition and 25% partially agreed. There were no disagreements, full or partial.

Regarding question 7, when asked if the main reason to share information and knowledge would be personal satisfaction, again, the majority was positive: 58.3% fully agreed and 33.3% partially, there were no disagreements. It is argued that this posture can be derived both from personal values that the subject has incorporated throughout life, and also as a consequence of a developed sense of self-efficacy, which is the belief in one's own ability to realize and build knowledge (BANDURA, 1978; BAO; HAN, 2019).

Similarly, in Question 8, "I share information and knowledge with people I am friends with, whether or not they receive something in return": 75% fully agreed; 16.7% partially; 8.3% gave a neutral answer and there were no disagreements. These results reinforce SET's conclusions that love/friendship can be in itself an important reward for the subject who yields his knowledge to others (FOA; FOA, 1974, 1980 apud CROPANZANO; MITCHELL, 2005; LAWLER; TYE, 1999). However, such positive behavior is only possible in harmonious organizational contexts, where managers show genuine interest in employee well-being (SOUZA, MORAES, 2018; TAKEUCHI; NONAKA, 2008).

Considering the impacts of both self-centered factors, i.e., aimed at direct reciprocity for the benefit of the information and knowledge sharer, as well as altruistic factors and aimed

at collective well-being, it is pertinent to examine more specific aspects of the relationship of SET with the mediation of information from the perspective of the subjects researched.

4.2 *Convergence between SET and the mediation of information and knowledge*

Table 3 shows the answers to the questions that deal more specifically with the willingness of the respondents to mediate the information/knowledge, i.e., a genuine concern that the recipient will be able to appropriate the information. It is reiterated that "[...] working with information is not simply making it available" (BORTOLIN; CRUZ, 2016, p. 120, our translation).

Table 3. Aspects concerning the mediation of information and knowledge.

Affirmative	Scale					Σ
	4	3	2	1	0	
9. When I share information and knowledge with someone I always make sure that the person will be able to understand that information, that their language and/or concepts are understandable to them	08 [66,7%]	03 [25%]	01 [8,3%]	00 [0%]	00 [0%]	12 [100%]
10. I always try to understand my coworker's problem/need as well as possible, to share with him/her information and knowledge that I believe is really useful to solve it.	11 [91,7%]	01 [8,3%]	00 [0%]	00 [0%]	00 [0%]	12 [100,0%]

Legend: scale - [4] I fully agree; [3] I partially agree; [2] I neither agree nor disagree; [1] I partially disagree; [0] I fully disagree

Source: Elaborated by the authors (2020).

Question 9 asks whether the respondent, in sharing information and knowledge, is concerned that it is understandable to the recipient, whether the language is appropriate to him or her, whether the underlying concepts are understood. In this aspect, there is a clear tendency towards agreement, where: 66.7% agree fully; 25% partially; 8.3% were neutral and there were no disagreements. In this aspect, the mediation process is a personalized action that takes into account the cognitive level of the subject, his personal framework of previous knowledge, being, therefore, an act of appreciation by the receiver of information, an effort that requires knowing well the other. This level of strengthening of social ties, friendship, collegiality, is precisely the fundamental prerequisite for SET. This is a cyclic process, in which pre-existing knowledge helps to understand the information, which in turn helps to form the new knowledge.

The assimilation of information differs from individual to individual. If ten people read the same text, in the same space, and at the same time, each one will have a different version of the text, suggesting that each one, with their tacit pre-knowledge on the subject, groups the information already existing in their memory with the new, transforming everything into a new knowledge [...] (FACHIN, 2013, p. 29, our translation).

This inquiry is pertinent, since, for Almeida Júnior (2015), information does not exist a priori; what exists is a set of data, a 'proto information', which only becomes real information at the moment it is understood by the subject. Similarly, it could be said that a book in an ignored language constitutes only proto information, since it is a set of data that, however, the subject is not able to use to satisfy his information needs.

Question 10 verifies whether respondents seek to understand the informational need or problem of coworkers, and then share with them information that is effectively useful to resolve them. For Almeida Júnior (2015), one of the main functions of the mediator is to identify the

subjects' informational needs, although this need is sometimes not clearly stated. Sometimes, affirms Taylor (1967), the subject has only a feeling of inadequacy, that something is missing to accomplish his intention, but that he does not know exactly what. To this kind of informational need, this author (1967) calls visceral need. This is where all the experience and sensitivity of the mediator must come in to interpret the clues given by the potential receiver of information, which is not an easy task. Finally, it is necessary to expose that, for Almeida Júnior (2015), the informational need is never fully satisfied, because the assimilation of information can generate new needs, new doubts and worries.

The answers to question 10 were the following: 91.7% fully agreed; 8.3% partially agreed; there were no neutral answers or partial or full disagreements. Thus, the answers show that the unanimity of those surveyed makes an effort to carry out a real mediation of information, not just passing on or transferring information. This finding shows the need to broaden the understanding of the existence of mediation outside traditional information equipment, libraries, archives and museums. This amplification is all the more pertinent when we see that the concept of mediation draws from the source of several disciplines besides the Librarianship and the CI. "The interdisciplinary of the area allows the transit between the epistemological borders, thus making the concept of Mediation flane by several methods" (BORTOLIN; LOPES, 2016, p. 123).

As pointed out by Souza (2019), software developers use the Internet as one of their main sources of information. However, Fachin (2013) recognizes that there is a huge profusion of web content and that the mediator can be useful, to help others, using his experience, navigate this information corpus, helping in the recovery of the most relevant information, effectively and in a timely manner.

Therefore, it is considered, by the data presented and discussed, that the effective mediation of information is a possibility also outside the traditional informational equipment. In addition, it was found that respondents have a greater tendency to present more altruistic behaviors, which take into account the group's benefit and friendly relations. This positive tendency to collaborate with coworkers and with the organization by sharing/mediating knowledge and information occurs despite the fact that the scientific literature points out the existence of barriers such as: distrust, information monopoly and negative organizational climate (DAVENPORT; PRUSAK, 1998; CHIAVENATO, 2003). However, a possible explanation for the preponderantly positive results of this research may be both in the existence of a favorable organizational environment in which the surveyed professionals work, and in values of cooperation learned and reinforced in the context of graduation. These values, passed by the educational institution, as already presented, emphasize the dynamics of organizational behavior and teamwork.

In addition, there is also an expressive aspect of the search for direct reciprocity, as 75% of respondents responded that they share information and knowledge hoping that this can help them grow in their career. Here, egocentrism and altruism, apparently antagonistic factors, coexist and complement each other from the perspective of professionals. This phenomenon is in line with the observation of Takeuchi and Nonaka (2008) that organizational knowledge is inherently made up of contradictions, between tacit and explicit, top of the hierarchy and bottom, and the like. From a dialectic perspective, these authors (2008) affirm that contradiction should not be extirpated, but cultivated, as a generator of change and innovation. Dialectics, in the view of the German philosopher G. W. F. Hegel, has as its basic principle that "all things contain sides or contradictory aspects, whose tension or conflict is the driving force of change and eventually transforms or dissolves them" (DIALECTICAL MATERIALISM, 2020, our translation, not paginated).

5 FINAL CONSIDERATIONS

In short, it is considered that the evidence collected points to the existence of an effective mediation of information among the researched software developers. Furthermore, it was found that the motivations for this mediation are more focused on social exchanges towards collectivity and friendship. However, it was also expressive the proportion of researchers who claimed to share information and knowledge aiming at career growth, which configures a search for direct reciprocity, which was defined in the present research as egocentric motivation. Thus, altruistic and egocentric motivations, apparently contradictory, reconcile themselves dialectically to collaborate with the sharing/mediation of information and organizational knowledge.

In addition, the literature review conducted exposed the existence of factors that represent potential barriers to the sharing of information and knowledge, such as: distrust, information monopoly and dissatisfaction at work. However, the results of this research showed a preponderant tendency for the sharing of information and knowledge and collaborative spirit among those surveyed.

As discussed throughout this paper, positive results with a more altruistic approach may have their roots in the assimilation of learned ethical/moral values, as well as a response to a work context in which the needs of employees are taken into account, generating a positive organizational climate. Although the questionnaire does not reveal specific aspects of the respondents' work context, the survey verified another important factor for the internalization of positive values in relation to coworkers and the organization, which is academic training. It was found that there is an effort of the researched teaching institution to combine technological training with a sensitivity to understanding the dynamics of organizational behavior and context. This ends up forming a differentiated professional, who possesses humanistic skills that are essential for teamwork and harmonious relationships with coworkers, indirectly influencing the effectiveness and productivity that comes from effective mediation of information.

It is concluded that there are convergences between SET and the mediation of information, both in the theoretical and practical aspects, especially when they analyze the factors that lead to sharing, especially the altruistic motivation. However, it is inferred that self-centered motivators, focused on the own benefit, can coexist with these altruistic motivators. As a limitation of this research, the relatively small sample size stands out. However, it is argued that the gathering of various sources of evidence on the subject studied could bring greater consistency to the results. Although it is not possible to make a statistically rigorous generalization of the study, it contributes qualitatively to the area of CI, unveiling the informational perspectives of a relevant professional niche, pointed to the possibility of mediation of information outside the traditional informational equipment: libraries, archives and museums. As future research, it is recommended to apply research with professionals trained in the area of Analysis and Development of Systems, Information Systems and Computer Science, in a broader dimension and with expanded locus.

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