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The use of technology to assist in the performance of daily activities and to carry out communication between individuals has become a necessary task in the face of technological advances. In the context of public institutions, the insertion of technology is also based on the possibilities of making the activities of this sector more efficient and better quality, in addition to allowing greater transparency and accessibility of information for society. For public managers, the information and communication technology tools allow for a more accurate assessment of the variables and possibilities involved in a decision-making process and, thus, to make better decisions in a sector whose main customer is society (users). Therefore, this paper aimed to analyze the use and acceptance of a decision support tool in a public educational institution called the Indicators Panel. For this, the Unified Theory of Acceptance and Use of Technology (UTAUT) was used, and the results were measured using the paraconsistent logic. The results indicate that it is possible to consider the use and acceptance of the decision support system in the public educational institution by reducing the propositions of the UTAUT Model in three factors: Usability, Performance, and Relationship. Regarding the UTAUT Model, it was found that the moderating variables of gender, age, and experience do not significantly influence the adoption of the decision support system. It is important to note that managers point the tool as very important for the development of their activities and emphasize that ease of use is one of the main points for the adoption of technology.

Keywords: UTAUT. Technology acceptance and use. Public sector. Information Technology. Decision support system. Paraconsistent logic.

1. Introduction

Information and Communication Technologies (ICT) are present in people's daily lives, and the adoption and use of ICT by society are irreversible, as their use has allowed advancement in several areas of activities in the community (Sanchez, Sanchez, & Albertin, 2015).

Organizations are also part of this scenario of using technology in favor of daily activities. The adoption of technology has an impact on decision making, improvement in customer service, and the execution of specific tasks (Gomes et al., 2019, p. 47).

Thus, the development of systems capable of offering technology to the manager in the decision-making process has been a challenge for organizations, researchers, and developers. Among the various

systems, such as an Enterprise Resource Planning (ERP) or a Management Information System (MIS), Heinzle, Gauthier, and Fialho (2010) highlight the Decision Support Systems (DSS). DSS has an important characteristic of supporting decision making through the use of technologies. These technologies perform data comparison, analysis, and simulation operations, allowing a significant number of variables to be considered in the decision-making process.

DSS is designed to assist organizations in the current global context where information is available and requires managers to make decisions that are increasingly faster and more accurate. However, a DSS has distinct characteristics, such as the centralization of various data sources and manipulation performed by the user, when compared to other systems such as MIS or ERP. Thus, the implantation in an organization must be planned according to the reality in question.

The benefits of ICT can be tangible and intangible. In the first case, they directly affect the company's results and, in the second case, they improve the business, but they do not directly affect the company's achievements (Albertin, & Albertin, 2008; Santa, Mussi, & Nascimento, 2016).

In the scenario of decision making by managers, Simon (1959) highlights that deciding is a cognitive act governed by characteristics of human cognition that affects decision making due to how the individual interprets information. Therefore, managers must understand the benefits of using and accepting technologies to support decision making.

However, one of the major challenges in the implementation of Information and Communication Technologies systems is the use and acceptance of new technology by users. Bobsin, Visentini, and Rech (2009), through a literature review, found that many works were dedicated to research and develop theories to evaluate how the process of acceptance and use of systems occurs, mainly with the use of the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003).

The UTAUT model aims to assess the use and acceptance of information technology. Therefore, in the context of information systems in organizations, this theory makes it possible to understand how users use and accept information systems. In this study, the term information systems will be used as a set of data and information organized in an integrated manner, in order to meet users and anticipate their needs, as defined by Guimarães and Évora (2004).

The benefits of using information technology for business strategies are linked to the reduction of time to perform tasks and to increase the qualification of employees, improvement in the quality of information, growth in operating revenue and investments, security, and compliance. In the period from 2001 to 2011, the industries that invested the most in IT were those that obtained the best financial performance, revenue growth, and best operating results, when compared to sectors that invested less in the same period (Moura et al., 2017).

Regarding the implementation of information management and decision support is the Federal Institute of Education, Science, and Technology (IFRO), an educational institution established in 2009 and which brings with it the mission of internalizing professional education in the State of Rondônia (Brasil, IFRO, 2014). Despite the centennial of the Federal Education Network in Brazil, in Rondônia, the IFRO was effectively installed in 2008 with the creation of the Federal Institute, since up to that moment it had only one agricultural teaching unit in the interior of the state, since 1993 (Brasil, IFRO, 2014).

IFRO has excellent relevance in contributing to the growth of the state and in the development of

research and extension for society. In 2017, it reached nine traditional learning units and 23 distance learning centers across the state, in addition to 176 distance learning centers in partnership with the State Government (Brasil, IFRO, 2018). This vertiginous growth demonstrates the importance of the institution for the state. However, it raises a high level of information and requires managers to be able to evaluate for decision making.

In this continually evolving scenario and with the challenges imposed, in 2015, IFRO sought to develop and implement a tool to support decision-making, called the Indicators Panel. This tool is aiming at improving and managing efficiency in terms of resource allocation, people management, and customer service, quality standards for civil servants, and students across the state.

Thus, the general objective of the research was to analyze the managers' perception regarding the use and acceptance of Decision Support Systems (DSS) at the Federal Institute of Education, Science, and Technology of Rondônia. In addition, as a specific objective, the importance of Decision Support Systems for Federal Institutes was verified, the acceptance of DSS, the IFRO Indicators Panel, identifying the predictive factors of the intention to use and the users' behavior during the application of technologies and sought to relate the variables (gender, age, experience, and voluntariness) with the factors that moderate the intention and behavior in the effective use of the DSS. For data treatment and analysis, paraconsistent logic associated with factor analysis and average ranking was used.

This article is organized as follows. Section 2 presents the theoretical framework, section 3 the methodology used (data collection instrument, population and sample and the description of the treatment and analysis of the data), section 4 presents the results and analyzes carried out from the data collected, and finally, section 5 points to the conclusions.

2. Theoretical background

After World War II, three basic trends began to transform organizations and the way they are managed. According to Porto and Belfort (2001), marketing was beginning to emerge as an increasingly important element in conquering markets. The impact of new technologies was expanding at an accelerated rate - especially in the fields of electronics, information, and communication and materials, making the world subjected to a process of high expansion and diversification of businesses, markets, and products. In this evolution, communication has become one of the pillars for organizational development, especially to support decision-making processes (Moreira, Bruno & Ribeiro, 2014).

In recent years, organizational changes have promoted changes in habits and in the way of managing (Silva, Silva & Gomes, 2016, p. 2781). There have been major changes in the managerial and organizational environment of institutions that are directly related to ICT, whether due to the emergence of new technologies or new applications, even opportunities created from new technologies, or in the way they are applied. Investing resources to modernize their technological infrastructure as a way to automate and support managerial capabilities has been the option to keep organizations competitive (Moreira, Bruno, & Ribeiro, 2014).

The use of information and communication technology offers benefits such as reduced costs, increased productivity, improved quality, flexibility, and innovation (Albertin & Albertin, 2008). For an organization,

determining how to use ICT to add value to its business is critical, and the results of the organization's success depend on how its users and stakeholders benefit from investments in technology.

Thus, technologies allow managers to have adequate tools for decision making based on the results of data converted into information more quickly. Therefore, its value has been added as another differential in the increase of work in organizations. Considering several sources (internal and external), the processing of information provides the organization of processes and improvement of the conditions for making information available to stakeholders, many times through the management of specific projects, allowing a more precise decision making with the perspective of generating competitive advantage (Guimarães & Évora, 2004; Larieira & Albertin, 2015).

Decision Support Systems (DSS) appeared between the 60s and 70s, being pioneering systems in the process of solving unstructured management problems. A DSS is a set of software and hardware that processes information interactively and assists decision-makers in a semi-structured or unstructured way (Bidgoli, 198; 9Pearson & Shim, 1995; Costa, 1997; Bispo, 1998; Fisher, 1998; Clericuzi, Almeida, & Costa, 2006; Courtney, 2001; Silva et al., 2013; Laudon & Laudon, 2018).

For decision-making, organizations rely on many variables, economic and political interests, whether explicit or implicit. Thus, it is necessary to have support in this decision-making process to find the most viable alternative among the possible ones. For this, information systems, in this new reality of technologies daily and with increasing complexity for decision making, have established themselves as an important support tool, as they use proven data and facts, enabling a more informed decision agreed by the manager (Bispo, 1998; Heinzle, Gauthier & Fialho, 2010).

In research on acceptance and use of technologies, the seminal model used is called the *Technology Acceptance Model* (TAM) and was published by Davis (1989), based on *Theory of Reasoned Action* (TRA), to predict acceptance and the use of technology in the work context (Faria et al., 2014).From these studies, new ones emerged, with the proposal to fill in the gaps and create constructs that could contribute to the initial studies of Davis (1989). Based on several studies already carried out, Venkatesh et al. (2003) developed the *Unified Theory of Acceptance and Use of Technology* (UTAUT).

UTAUT (Venkatesh et al., 2003) came up with the proposal to unify the following theories: Theory of Rationalized Action (TRA) (Fishbein & Ajzen, 1975); the Technology Acceptance Model (TAM) (DAVIS, 1989); the Motivational Model (MM) (Davis, Bagozzi, & Warshaw, 1989); the Theory of Planned Behavior (TPB) (Ajzen, 1991); the combination of TAM and TPB (Taylor & Todd, 1995); the PC Utilization Model (MPCU) (Thompson, Higgins, & Howell, 1991); the Innovation Diffusion Theory (IDT) (Rogers, 2003) and the Social Cognitive Theory (SCT) (Compeau & Higgins, 1995).

In this way, UTAUT added and generated a complete model with the main constructs related to the use and acceptance of information and communication technology. According to the model, as can be seen in Figure 1, the four determinant constructs are performance expectation, effort expectation, social influence, and facilitating conditions (Venkatesh et al., 2003). There are still four moderators who are personal characteristics of individuals (users) who have a moderating role and can influence the acceptance and use of the technology in question: Gender, Age, Experience, and Voluntary use.

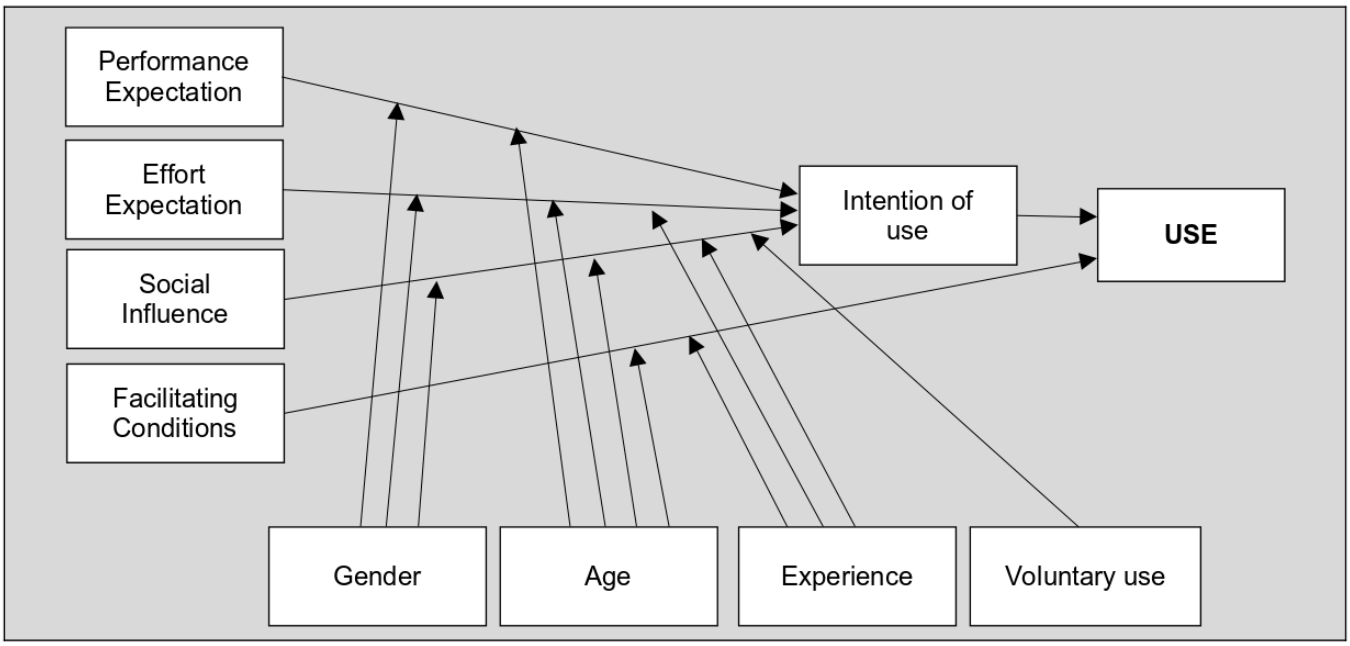

Figure 1. UTAUT model (Venkatesh et al., 2003).

Performance expectation measures the degree to which the individual believes that using the system will increase his performance at work. The expectation of effort assesses the degree of ease associated with using the system. Social influence determines the degree to which the individual considers the opinion of others about whether or not to use the system important. And the facilitating conditions assess the individual's degree of perception about the existence of technical and organizational infrastructure to use the system.

Subsequently, with the perspective of applying the model to the consumer context, Venkatesh, Thong, and Xu, in 2012, extended UTAUT by incorporating constructs of hedonic motivation, price, and habit (Venkatesh, Thong, & Xu, 2016). This extension was called UTAUT2; however, as the present research analyzed the use and acceptance by users of the system, the theory used was UTAUT.

3. Research methods

This research is quantitative, based on two pre-established theories as methodological support (Creswell, 2009). The adopted methodology is descriptive, approaching the explanatory since it aims to discover the existence of association or relationship between variables (Gil, 2002). The adopted method starts as descriptive as a way to present the quantitative analyzes performed and goes to inferential evaluating cause and effect from the samples (Trochim, 2018). Therefore, as this research intends to relate the cause (implementation of the Indicators Panel) and impact (use and acceptance in the IFRO decision-making process) between the events, this research is close to the explanatory one, expanding its scope of analysis.

3.1 Research instrument

A direct investigation was carried out to participants through a structured data collection instrument (survey). The survey was based on the Integrated UTAUT model and elements related to the Theory of

Bounded Rationality (Simon, 1959), since it is expected to evaluate the relevance of research in the area.

3.2 Research Population and Sample

The chosen organization of study was the Federal Institute of Education, Science, and Technology of Rondônia. It was requested to approve the project at the institutional level, with the Rectory / IFRO and the Research Ethics Committee of the Federal University of Rondônia (UNIR) in 2018.

The Federal Institutes of Education, Science, and Technology are institutions of higher, basic and professional education, pluricurricular, and multicampus specialized in offering professional and technological education in different teaching modalities (BRASIL, 2008). These make up the Federal Network for Professional, Scientific, and Technological Education, linked to the Ministry of Education and created by Law No. 11,892 of 22 December 2008.

The Federal Institute of Education, Science, and Technology of Rondônia (IFRO), located in the state of Rondônia, was created in the state through the junctions of the Federal Technical School of Rondônia and the Federal Agrotechnical School of Colorado do Oeste. Thus, IFRO started its activities in the state in 2009 and is consolidating itself in this scenario with the provision of free public education (BRASIL, I., 2014). IFRO's activities in the state are limited to 10 units, with a rectory in the capital (Porto Velho) and nine campuses.

The technology under study is the decision support system that IFRO implemented in 2015, called the "Indicators Panel", based on Business Intelligence (BI), an open-source OLAP (Online Analytical Processing) tool aimed at business intelligence. The proposal was initiated in late 2014 to facilitate the information collection process, previously decentralized in different systems, which required time and effort by the people involved in the process. The system performs analysis of large volumes of data and integrates with the other systems of the institution to process data in a distributed way. The software "Indicator Panel" is composed of data originating from the academic system of the institution in the case of classroom teaching, virtual environment database of learning in the case of distance learning and systems of the federal government, such as Integrated Management System of Personnel (SIAPE), National Information System for Professional and Technological Education (SISTEC) and Integrated System of Financial Administration of the Federal Government (SIAFI). Figure 2 shows the system screen.

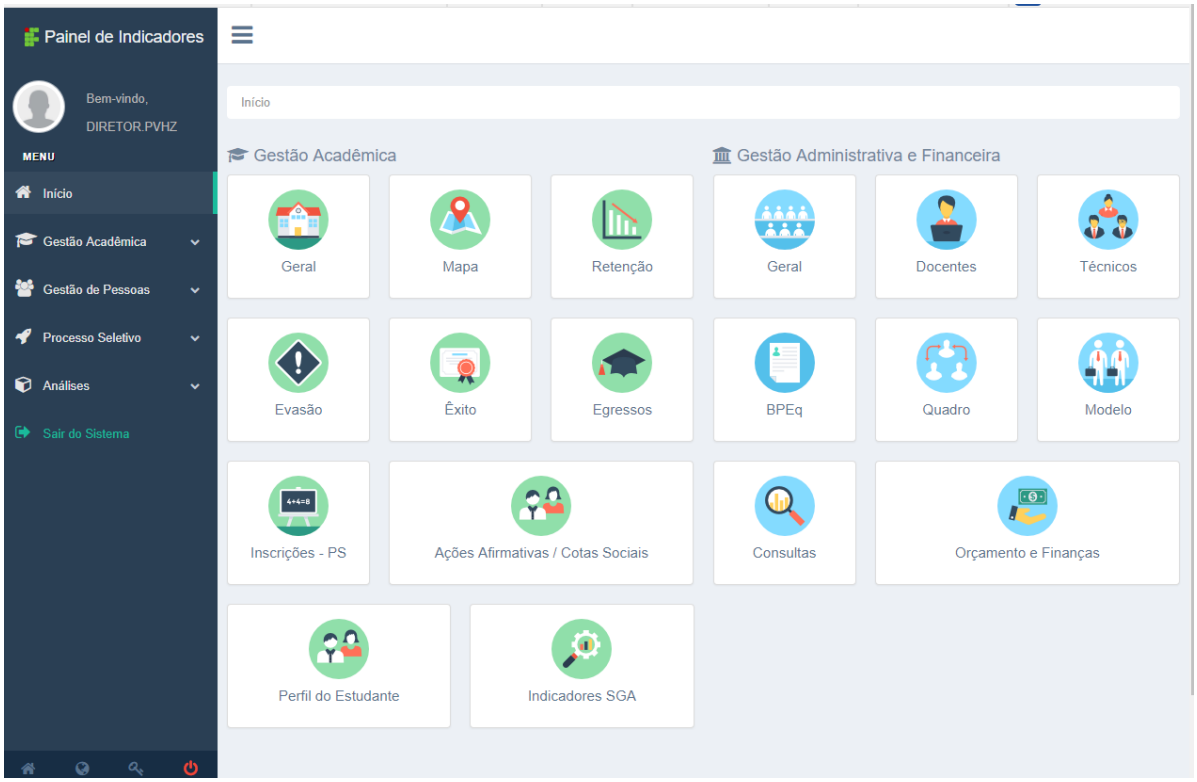

Figure 2. IFRO Indicator Panel screen (Print screen http://painel.ifro.edu.br, accessed on 9 October 2018)

As for the application of the data collection instrument using the UTAUT Theory, the target population was the 74 managers of the Federal Institute of Education, Science and Technology of Rondônia of the nine units that make up the IFRO, characterizing the study as to the elements of the population as a census (Babbie, 2003).

However, even to collect data to have a census characteristic, that is, it sought that all individuals participate in the research, it was a research with voluntary collaboration. Thus, it was not possible to obtain the answer from all managers. The total responses received, after three e-mails sent to managers in seasonal periods, were 67 responses. Thus, the data analysis has a 99% confidence level and a 5% margin of error, with the collection being conducted from 9 April to 30 May 2018.

Thus, the sampling of this research is characterized as non-probabilistic, which according to Cooper and Schindler (2003, p. 152), is an "arbitrary (non-random) and subjective" technique since the elements of the sample were not elected "Randomly", therefore, is not random sampling.

3.3 Data Treatment and Analysis

As a way of analyzing the reliability of the data collection instrument, we opted for the paraconsistent logic and Cronbach's alpha coefficient. Lee J. Cronbach presented the Cronbach's alpha, in 1951, as a way of estimating the reliability of a questionnaire applied in a survey (HORA, MONTEIRO, & ARICA, 2010, p. 90). It is the average correlation between questions since all items in a questionnaire using the same scale to measure it (Hora, Monteiro, & Arica, 2010, p. 91).

However, the use of classical logic for processing data and information can sometimes not be the most appropriate to portray real-world situations and propositions. In this case, it was also chosen to use

Paraconsistent Logic, a non-classical logic, which by accepting contradictions as theses in its structure, can be applied in several areas of knowledge (Silva Filho, 2009). While the studies resulting from Evidential Logic limit the premises to only partial evidence, in Annotated Paraconsistent Logic (APL), the degree of credibility or belief that the premises confer on the conclusion is considered. The determination of premises is the task of scientific research, and the validity or not of the argument is determined by a logical study (Silva Filho, 1999, p. 9).

The data collection instrument, based on the theory of the UTAUT Model, collected data regarding the acceptance and use of the Decision Support System (DSS) using the Likert scale. Such theory provides a structured data collection instrument, already validated and tested, which has been adapted to the reality of the present research.

Data analysis took place through Factor Analysis, which is a multivariate approach and aims to discover patterns in the values of several variables, "essentially by the generation of artificial dimensions (factors) that correlate highly with several of the real variables" (Babbie, 2003).

Thus, this study sought to simplify, through Exploratory Factor Analysis (AFE), the data from the data collection instrument based on the UTAUT model to identify which major factors can be considered in improving the deployment for the use and acceptance of the Panel system. Indicators of the institution, that is, which propositions form a scope of relationship that can determine what is really important to be measured and monitored in the use and acceptance of DSS in the institution.

The Principal Component Analysis method was used to extract the factors, which takes into account the total variance in the data by verifying a linear combination between the variables so that the maximum variance is explained. This process is always repeated to seek a new linear combination and demonstrate the greatest amount of variance remaining (Corrar, & Paulo and Dias Filho, 2014).

The mode of analysis of the variables chosen was the R-mode factor analysis, which seeks to identify underlying structures capable of being perceived only by building relationships between several variables (Corrar; Paulo and Dias Filho, 2014).

The choice of the number of factors can be defined using the eigenvalue criterion, slope graph criterion, or screen plot, and by the percentage of the explained variance. In this research, we opted for the percentage of explained variance, as it was defined that the set of propositions must answer for at least 70% of the variance. The rotation of the Varimax factors was performed to expand the explanation of the factor analysis, which is a type of orthogonal rotation (keeps factors perpendicular to each other), which makes it easier to identify the relationship with a single factor (Corrar, & Paulo and Dias Filho, 2014). The initial analyzes were performed based on the responses of the data collection instrument using the data analysis software IBMS SPSS Statistics.

There was a verification of the reliability analysis of the scales used in the research (Cronbach's alpha). Thus, the values obtained should be consistent with those that are usually cited in the literature, 0.70 as an acceptable minimum (Hora, Monteiro, & Arica, 2010).

In the present study, initially, the coefficient obtained was 0.849. With these results, it is considered that there is good reliability of the data, being adequate for this research. However, Cronbach's Alpha of the four determinants of the UTAUT model was also analyzed individually. Each construct is outlined in Table 1.

Table 1. Cronbach's alpha value for each UTAUT construct

Construct	Cronbach's Alpha value
Performance expectation	0.768
Expected of effort	0.894
Social influence	0.709
Facilitating conditions	0.443

Source: Elaborated by the authors

As the construct "Facilitating conditions" obtained an alpha value below 0.7, it was disregarded from the analysis. After a new verification, the Cronbach's Alpha obtained was 0.844, which still allows certifying the reliability of the data.

The next step in the analysis of the reliability of the research data used the analysis by the paraconsistent logic applied to the propositions of the UTAUT Model.

Thus, the calculations were performed and shown in Figure 3, taking as a basis the concepts of Paraconsistent Logic.

After identifying the factoring agreement and the factor disagreement, Sanches, Meireles, and Sordi (2011, p. 11) establish the need for the conversion of beliefs and disbelief using the logical operators OR and AND. The connective logic is determined by comparing μ1 (degree of belief) and μ2 (degree of disbelief), as shown in Figure 3, where the result operated by OR is the output of the highest value of the two inputs and the result operated by AND is the output of the lowest value of the two inputs. Thus, it can isolate the factors of greatest influence in decisions.

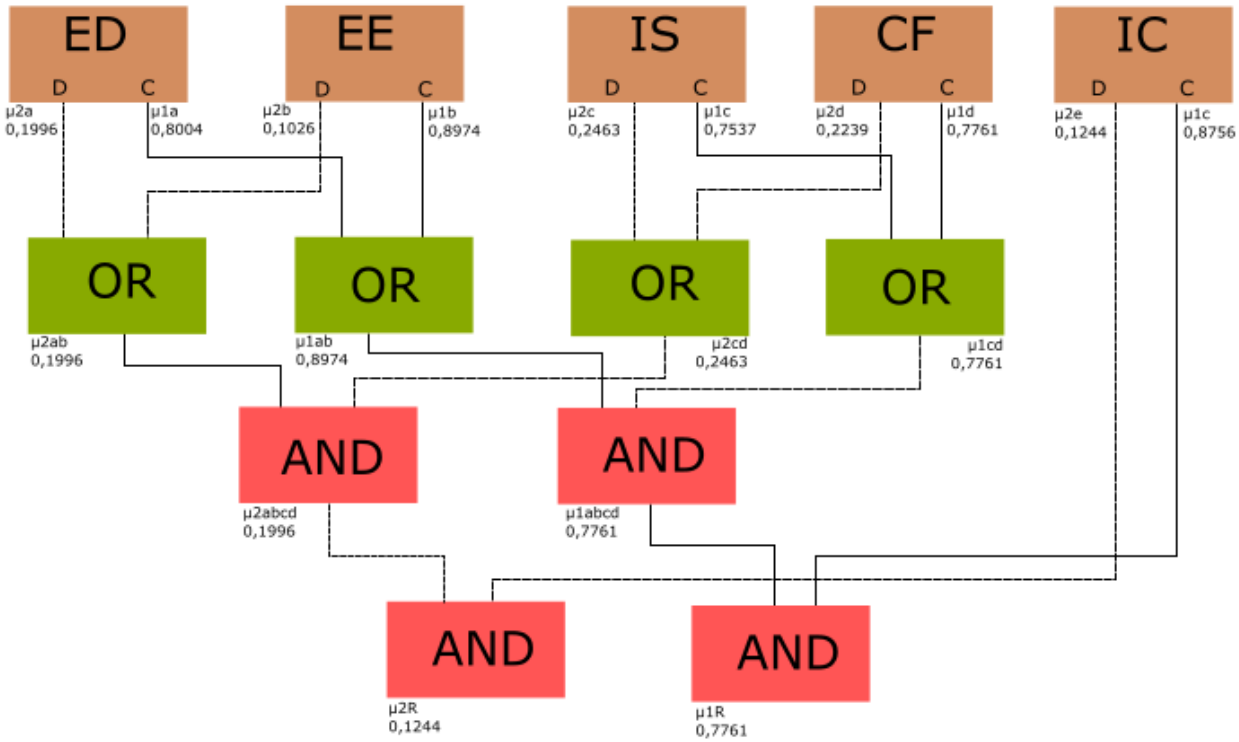

Figure 3. Logical networks for converting the degree of belief and disbelief

Therefore, from the Paraconsistent Logic, the degrees of belief (μ1) and disbelief (μ2) were calculated in relation to each factor, and the degree of certainty (G1) and the degree of contradiction (G2) were obtained. With the results of the degree of certainty and uncertainty, it is necessary to normalize and interpret the result, seeking to standardize the language to enable further comparisons, the proposed model has step 5 in which the outcome is normalized so that the final result is expressed in the range of [0; 1] (Silva Filho, 2009).

Degree of certainty:

$(G\ 1 = \mu 1R - \mu 2R) = 0.7761 - 0.1244 = 0.6517$

Normalization of the degree of certainty:

$$G_{1n} = \frac{G_1 - (-1)}{1 - (-1)} = \frac{G_1 + 1}{2} = \frac{0.6517 + 1}{2} = 0.82585$$

Degree of uncertainty:

$(G\ 2 = \mu 1R - \mu 2R - 1) = 0.7761 + 0.1244 - 1.00 = -0.0995$

Normalization of the degree of contradiction:

$$G_{2n} = \frac{G_2 - (-1)}{1 - (1)} = \frac{G_2 + 1}{2} = \frac{-0.0995 + 1}{2} = 0.45025$$

Then, the result of G1 and G2 is applied for interpretation, in the Cartesian Plan Unit Square (QUPC), as can be seen in Figure 4.

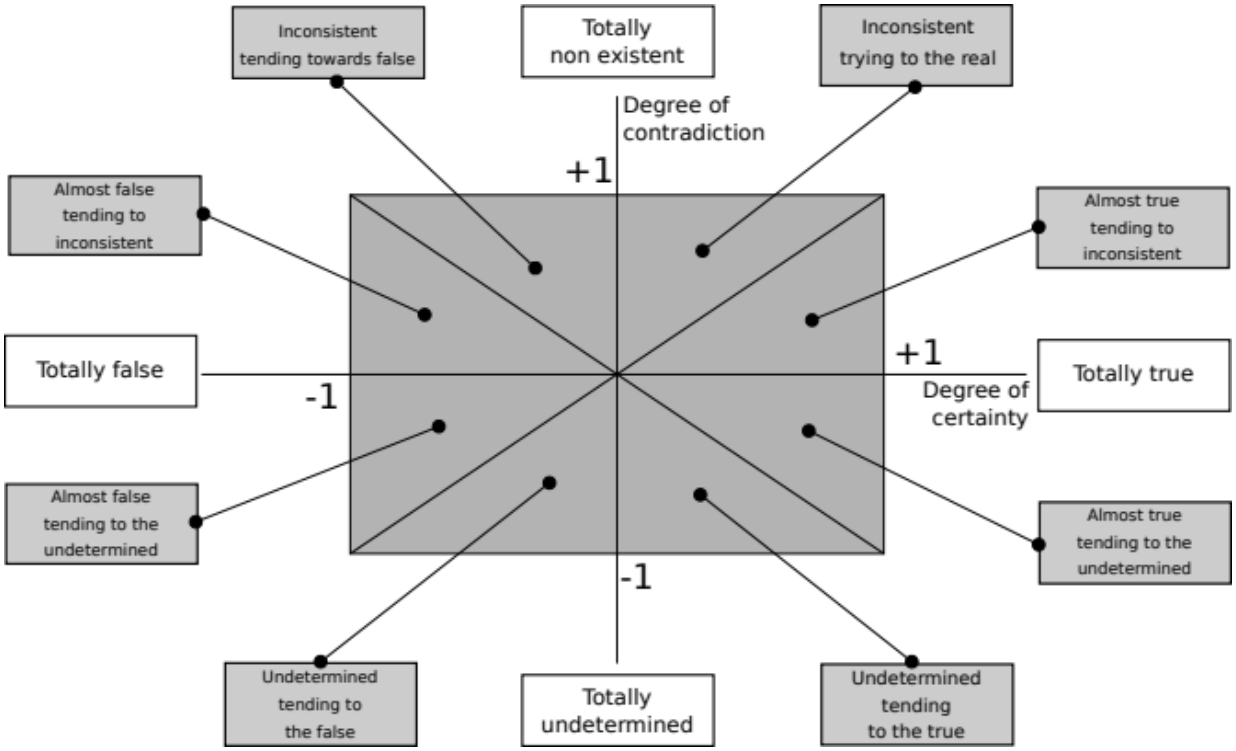

Figure 4. QUPC - Unitary Square of the Cartesian Plan

After the conversion from normalization, Davis (1976, p.70), also cited by Sanches, Meireles, and Sordi (2011, p11), proposes an interpretation for the normalized degrees of certainty and contradiction. Thus, Davis's framework was used (1976) adapted by Sanches, Meireles, and Sordi (2011).

Table 2. Convention to describe the interpretation and synthesis of information obtained by Likert scale regarding the G1n normalized degree of certainty and the G2n normalized degree of contradiction

Standardized degree of certainty G_{1n}		**Standard contradiction degree G_{2n}**	
Expresses how much the subjects adhere to the factor propositions (horizontal axis in QUPC)		Expresses the quality of the data used (vertical axis in QUPC)	
Observed Value	**Recommended interpretation**	**Observed Value**	**Recommended interpretation**
0.900 ou mais	Broad adherence	0.900 ou mais	Very contradictory data
0.700 a 0.899	Substantial adherence	0.700 a 0.899	Conflicting data
0.300 a 0.699	Moderate adherence	0.300 a 0.699	Consistent data
0.100 a 0.299	Low adherence	0.100 a 0.299	Incomplete data
0 a 0.099	Insignificant adherence	0 a 0.099	Ignored data

Source: Davis (1976), adapted by Sanches, Meireles, and Sordi (2011, p. 11)

Therefore, when verifying the degree of certainty data (G_{1n}) at 0.82585 and the degree of contradiction (G_{2n}) at 0.45025, the data show “Substantial adherence” and “Consistent data”, respectively.

In the last step of the data analysis, the Factor Analysis of the data collected by the data collection instrument based on the UTAUT model was performed. In this case, the objective was to verify how to reduce the propositions to demonstrate which prepositions represent the study model and which variables are identified, which better determine the acceptance and use of the institution’s decision support system.

Thus, the factor analysis was able to group the components into three essential factors for the acceptance and use of the Decision Support System of the Federal Institute of Rondônia, which were classified into Effort Expectation, Performance Expectation) and Social Influence. Based on these three identified factors, analyzes were carried out concerning the UTAUT moderators to list specific characteristics regarding the use and acceptance of the DSS.

The Gender, Age, and Experience moderators were analyzed using Pearson’s Correlation, which measures the degree of correlation between two variables of the metric scale and the Average Ranking (AR) that allows verifying the agreement or disagreement regarding the propositions.

Thus, for the average ranking, the identified weighted average was considered, which is calculated according to the frequency of responses of the scales indicated by the respondents using the formula: Weighted Average (WA) = $\sum(fi * Vi)$. Thus, AR = WA/(NS), where fi is the observed frequency of the propositions for each answer, Vi is the value of each answer, and NS is the sample number (Malhotra, 2018). Since the moderator voluntariness was removed from the analyzes since the system is mandatory in its use and according to Venkatesh et al. (2003), is more significant in environments where the use of a system is mandatory; thus, this construct has not shown relevance.

4. Results

The characterization of the respondents is presented as follows according to the four moderators of the

UTAUT model (Gender, Age, Experience, and Voluntary use). In the first case, regarding gender, it was verified that 58% of the managers of the institution are men and 47% women.

The graph in Figure 5 shows the age of the IFRO managers. It can be seen that 25% of managers are between 25 and 30 years of age and that 59% of managers are younger than 41.

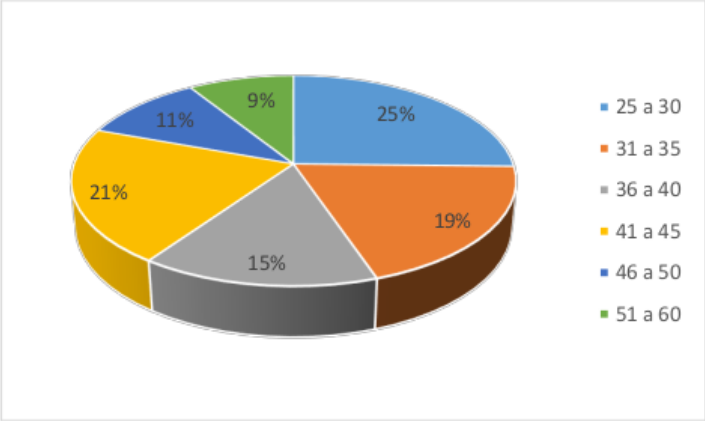

Figure 5. Age of responding managers
Source: Elaborated by the authors based on research data

Considering experience, Figure 6 shows the management time of the institution's managers. It can be seen that even with 59% of the managers being under 41 years of age, 42% of the managers have more than five years of management experience. With less than one year of management time, it can be seen that 7% are in this scenario. It is also noteworthy in this case that, despite the existence of the Campus Colorado do Oeste for more than 25 years, the performance of IFRO in the state as Federal Institute is only ten years.

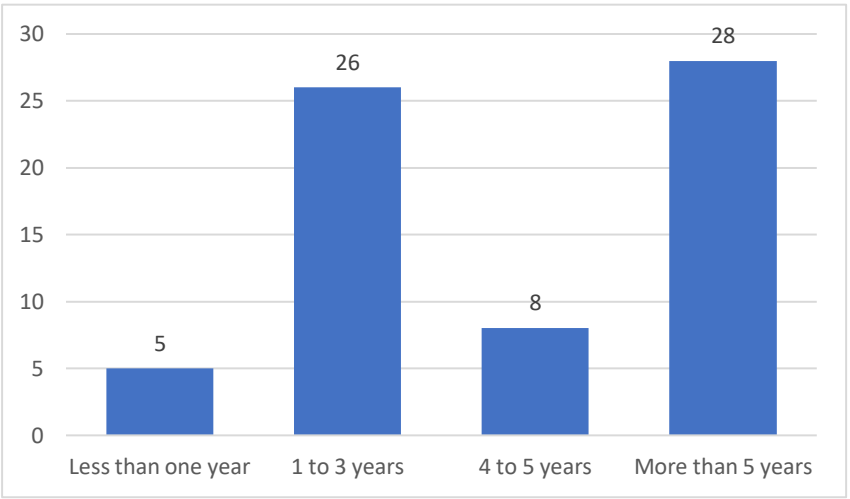

Figure 6. Management time of responding managers
Source: Elaborated by the authors based on research data

Considering the time of management according to gender identity, Figure 7 shows that there are, as well as in the case of men, a higher number of female managers with more than five years of management. It can also be verified that the proportion of management time between women and men is similar, considering the percentage of respondents.

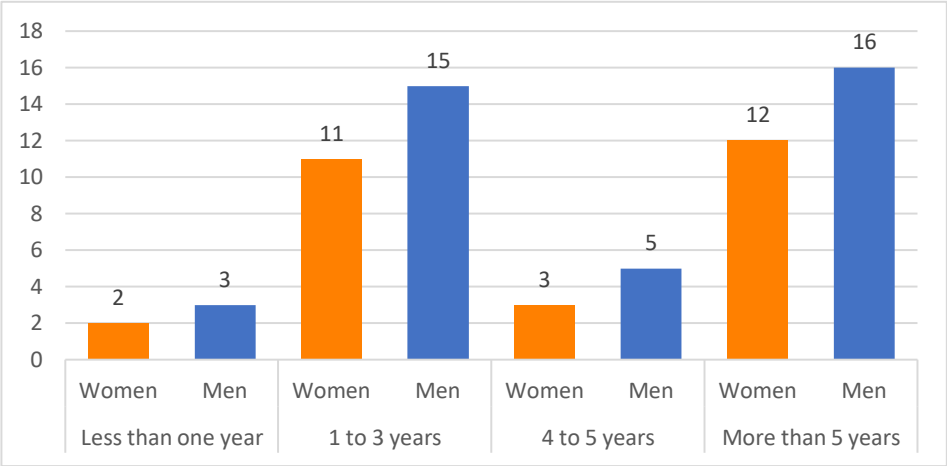

Figure 7. Management time of the respondent managers by gender identity

Source: Elaborated by the authors based on research data

In the Effort Expectation factor, the first item analyzed was "The system is useful for my work". It can be seen that there is a high agreement on the usefulness of the work for managers with a very high average ranking. In further detailing the analysis, it is noted that in the gender comparison, the agreement was higher for males on the usefulness of DSS for work, with 97.4 of degree of agreement of the proposition and 4.72 of average ranking for male respondents. The result can be seen in Table 3.

Table 3. Consideration of the usefulness of the system for the work of managers

Proposition [The system is useful for my work.]	**Semantic Differential**					**Total**	**Average Ranking**	**Disagreement with the proposition**	**Consistent with the proposition**	**Degree of agreement of the proposition**	**Degree of disagreement with the proposition**
	I totally disagree	**I Partially Disagree**	**Indifferent**	**Partially agree**	**Totally agree**						
Both sexes	0	0	6	10	51	67	4.67	3.0	64.0	95.5	4.5
Masculine	0	0	2	7	30	39	4.72	1.0	38.0	97.4	2.6
Feminine	0	0	4	3	21	28	4.61	2.0	26.0	92.9	7.1

Source: Elaborated by the authors based on research data

Another item analyzed that deserves highlighting in the Effort Expectation Factor was "My interaction with the system is clear and understandable". There is a "substantial agreement" concerning to clarity and understanding of the system use, both for the female and male public (Table 4). It can suggest that managers

agree that the system is useful for their work. However, the first problem of the Effort Expectation Factor is the clear and understandable interaction with the system, allowing us to infer that despite the importance of the decision support system, the interaction with the system does not occur satisfactorily. This statement is more evident for female managers from 1 to 3 years of management with a moderate agreement and managers of the sixth male from 4 to 5 years of management.

Table 4. Clarity and understanding of interaction with the system by management time

GENDER	Proposition [My interaction with the system is clear and understandable]	Semantic Differential					Total	Average Ranking	Disagreement with the proposition	Consistent with the proposition	Degree of agreement of the proposition	Degree of disagreement with the proposition
		I totally disagree	I Partially Disagree	Indifferent	Partially agree	Totally agree						
BOTH	Less than one year	0	0	0	3	2	5	4.40	0.0	5.0	100.0	0.0
	1 to 3 years	0	2	3	18	3	26	3.85	3.5	22.5	86.5	13.5
	4 to 5 years	1	0	0	5	2	8	3.88	1.0	7.0	87.5	12.5
	More than 5 years	1	0	6	15	6	28	3.89	4.0	24.0	85.7	14.3
MASCULINE	Less than one year	0	0	0	1	2	3	4.67	00	3.0	100.0	0.0
	1 to 3 years	0	0	1	11	3	15	4.13	0.5	14.5	96.7	3.3
	4 to 5 years	1	0	0	3	1	5	3.60	1.0	4.0	80.0	20.0
	More than 5 years	1	0	3	10	2	16	3.75	2.5	13.5	84.4	15.6
FEMININE	Less than one year	0	0	0	2	0	2	4.00	0.0	2.0	100.0	0.0
	1 to 3 years	0	2	2	7	0	11	3.45	3.0	8.0	72.7	27.3
	4 to 5 years	0	0	0	2	1	3	4.33	0.0	3.0	100.0	0.0
	More than 5 years	0	0	3	5	4	12	4.08	1.5	10.5	87.5	12.5

Source: Elaborated by the authors based on research data

The next item analyzed was “I find the system easy to use”, in which the gender identity and management time were compared, as can be seen in Table 5. It can be seen that the degree of disagreement for women is lower regarding not finding the system easy to use. One the other hand, for men, besides the

presentation of high disagreement with the item, there is a low agreement among managers who have 4 to 5 years of management, and this is a very relevant indicator of disagreement. It is also assumed by the other items that male managers have greater difficulty in using the system.

Table 5. Ease of use of the system

GENDER	Proposition [I find the system easy to use]	Semantic Differential					Total	Average Ranking	Disagreement with the proposition	Consistent with the proposition	Degree of agreement of the proposition	Degree of disagreement with the proposition
		I totally disagree	I Partially Disagree	Indifferent	Partially agree	Totally agree						
BOTH	Less than one year	0	0	1	2	2	5	4.20	0.5	4.5	90.0	10.0
	1 to 3 years	0	0	3	15	8	26	4.19	1.5	24.5	94.2	5.8
	4 to 5 years	1	1	0	2	4	8	3.88	2.0	6.0	75.0	25.0
	More than 5 years	1	0	5	6	16	28	4.29	3.5	24.5	87.5	12.5
MASCULINE	Less than one year	0	0	1	0	2	3	4.33	0.5	2.5	83.3	16.7
	1 to 3 years	0	0	1	8	6	15	4.33	0.5	14.5	96.7	3.3
	4 to 5 years	1	1	0	1	2	5	3.40	2.0	3.0	60.0	40.0
	More than 5 years	1	0	1	4	10	16	4.38	1.5	14.5	90.6	9.4
FEMININE	Less than one year	0	0	0	2	0	2	4.00	0.0	2.0	100.0	0.0
	1 to 3 years	0	0	2	7	2	11	4.00	1.0	10.0	90.9	9.1
	4 to 5 years	0	0	0	1	2	3	4.67	0.0	3.0	100.0	0.0
	More than 5 years	0	0	4	2	6	12	4.17	2.0	10.0	83.3	16.7

Source: Elaborated by the authors based on research data

Still in the Effort Expectation Factor was checked the item “Learning to use the system is easy for me”. It can be observed that managers partially or totally agree with this statement, with 88% of notes, which suggests the interest in learning how to use the decision support tool.

In the case of the Performance Expectation Factor, there are two items to analyze. This factor has aggregated propositions that relate to how the use of DSS affects the performance of the respondent. The first is "Using the system increases my productivity". It was verified that the percentage of total and partial agreement is practically the same. Yet, for 19% of the managers, it is indifferent to consider the increase in productivity from the use of the decision support system.

The second item of the analyzed Performance Expectation Factor was "Using the system allows me to perform tasks more quickly". In this case, the partial agreement was greater than the total agreement, which suggests that there are doubts if the system allows performing tasks more quickly. Female managers over five years of age were the most disagreed, however, because they also differed on ease of use and willingness to learn, it is understood that they cannot know that the system can make tasks faster because of the above. Male managers with less than one year of management presented a low agreement concerning the proposition, which allows us to suppose that their own inexperience with the system increases the time of learning and use of the tool. The results can be seen in Table 6.

Table 6. Using the system to perform tasks more quickly

GENDER	Proposition [Using the system allows me to perform tasks more quickly]	Semantic Differential					Total	Average Ranking	Disagreement with the proposition	Consistent with the proposition	Degree of agreement of the proposition	Degree of disagreement with the proposition
		I totally disagree	I Partially Disagree	Indifferent	Partially agree	Totally agree						
BOTH	Less than one year	0	1	0	1	3	5	4.20	1.0	4.0	80.0	20.0
	1 to 3 years	0	0	4	12	10	26	4.23	2.0	24.0	92.3	7.7
	4 to 5 years	0	0	1	3	4	8	4.38	0.5	7.5	93.8	6.3
	More than 5 years	1	1	5	12	9	28	3.96	4.5	23.5	83.9	16.1
MASCULINE	Less than one year	0	1	0	0	2	3	4.00	1.0	2.0	66.7	33.3
	1 to 3 years	0	0	0	9	6	15	4.40	0.0	15.0	100.0	0.0
	4 to 5 years	0	0	1	3	1	5	4.00	0.5	4.5	90.0	10.0
	More than 5 years	1	0	2	7	6	16	4.06	2.0	14.0	87.5	12.5

FEMININE	Less than one year	0	0	0	1	1	2	4.50	0.0	2.0	100.0	0.0
	1 to 3 years	0	0	4	3	4	11	4.00	2.0	9.0	81.8	18.2
	4 to 5 years	0	0	0	0	3	3	5.00	0.0	3.0	100.0	0.0
	More than 5 years	0	1	3	5	3	12	3.83	2.5	9.5	79.2	20.8

Source: Elaborated by the authors based on research data

Finally, we have the Social Influence Factor that was grouped to evaluate the items that demonstrate managers' perception of the use of DSS about other people. The first item analyzed was "The people I relate to think I should use the system". According to Table 7, the Average Ranking points to an indifference on the part of managers to the statement.

Table 7. Use of the system concerning people with whom managers relate

[The people I relate to think I should use the system]	**Semantic Differential**					**Total**	**Average Ranking**	**Disagreement with the proposition**	**Consistent with the proposition**	**Degree of agreement of the proposition**	**Degree of disagreement with the proposition**
	I totally disagree	**I Partially Disagree**	**Indifferent**	**Partially agree**	**Totally agree**						
Masculine	1	0	23	13	2	39	3.38	12.5	26.5	67.9	32.1
Feminine	0	0	19	7	2	28	3.39	9.5	18.5	66.1	33.9

Source: Elaborated by the authors based on research data

The next proposition analyzed was "People who are important to me think I should use the system", (Table 8). Again, a significant value of respondents, most of whom consider the statement to be indifferent, suggesting that even people who managers consider important are indifferent if they think they should use the system.

Table 8. Relationship between system use and the people who are important to the manager

Proposition [People who are important to me think I should use the system]	**Semantic Differential**					**Total**	**Average Ranking**	**Disagreement with the proposition**	**Consistent with the proposition**	**Degree of agreement of the pronosition**	**Degree of disagreement with the pronosition**
	I totally disagree	**I Partially Disagree**	**Indifferent**	**Partially agree**	**Totally agree**						
Both sexes	1	0	36	19	11	67	3.58	19.0	48.0	71.6	28.4
Masculine	1	0	20	11	7	39	3.59	11.0	28.0	71.8	28.2
Feminine	0	0	16	8	4	28	3.57	8.0	20.0	71.4	28.6

Source: Elaborated by the authors based on research data

In this item, the analysis by gender showed that in the woman's case, the difference is minimal, i.e., both managers tend to consider indifferent the perception of the system used by other people that they consider important.

Finally, the last item of the Social Influence Factor is "Managers show that using the system is important for their reputation". However, this research aims to evaluate the use and acceptance of the DSS by the managers of the institution. Therefore, this proposition despite presenting agreement, was not considered in the analysis since all are managers and presupposed to use the system. The results are presented in Table 9.

Table 9. Perception of managers about using the system being important for their reputation

Proposition [Managers show that using the system is important for their reputation]	**Semantic Differential**					**Total**	**Average Ranking**	**Disagreement with the proposition**	**Consistent with the proposition**	**Degree of agreement of the pronosition**	**Degree of disagreement with the pronosition**
	I totally disagree	**I Partially Disagree**	**Indifferent**	**Partially agree**	**Totally agree**						

Both sexes	1	6	22	25	13	67	3.64	18.0	49.0	73.1	26.9
Masculine	1	6	13	11	8	39	3.49	13.5	25.5	65.4	34.6
Feminine	0	0	9	14	5	28	3.86	4.5	23.5	83.9	16.1

Source: Elaborated by the authors based on research data

In order to enrich the analyses carried out, a correlation check between moderators (age, gender and management time) and the factors of acceptance and use of the Indicator Panel was performed in parallel using the SPSS (Statistical Package for the Social Sciences) software, version 24, from the calculation of the Pearson correlation where significant correlations at levels 0.01 and 0.05 were identified. Table 10 shows the analysis performed with the aggregate profile of men and women.

Table 10. Correlation between user profile and usage and acceptance factors

Proposition	Age	Management time	Gender
The system is useful for my work	-0.084	-0.090	-0.086
Using the system allows me to perform tasks more quickly	**-0.212**	-0.144	-0.061
Using the system increases my productivity	-0.137	-0.150	-0.007
My interaction with the system is clear and understandable	0.005	-0.065	-0.054
It will be easy to become a skilled system user	-0.084	-0.130	-0.112
I find the system easy to use	0.034	0.042	-0.046
Learning how to use the system is easy for me	-0.020	0.058	-0.021
The people I relate to think I should use the system	**-0.207**	-0.011	0.006
People who are important to me think I should use the system	-0.021	0.057	-0.011
Managers show that using the system is important to their reputation	0.158	-0.111	0.194
**. The correlation is significant at level 0.01 (bilateral).			
*. Correlation is significant at the 0,05 level (bilateral).			

Source: Elaborated by the authors based on research data

By analyzing the variables relating to the user profile, you can see that there are very few correlations. As can be observed in Table 8, there are few significant correlations, and the ones that are present a reduced

significance degree (equal or inferior to 0.05). We can also see that the intensity of the correlation is also reduced. As there is a weak negative correlation between age and the use of the system to perform tasks more quickly, it can assume that managers do not consider that using the system allows performing tasks more quickly.

In the same way, there is a weak negative correlation between age and the fact that managers perceive that the people with whom they relate think that they should use the system. It suggests that there is not total agreement with the preposition, corroborating with the presented graphics that there was partial agreement about the statement.

From the initial observations, it was separated the analyses by gender, to allow a more adequate understanding between the existing correlations of age and management time about the propositions of the UTAUT Model of use and acceptance of the Indicator Panel. Table 11 presents the result of the analysis separately from the correlation between men and women and the propositions.

Table 11. Correlation between user profile by gender and system use and acceptance propositions

Proposition	**Age**		**Management Time**	
	Masculine	**Feminine**	**Masculine**	**Feminine**
The system is useful for my work	-,003	,034	-,031	,220
Using the system allows me to perform tasks more quickly	**-,280***	-,151	-,141	-,150
Using the system increases my productivity	-,207	-,112	-,176	-,146
My interaction with the system is clear and understandable	,068	,117	**-,294***	-,222
It will be easy to become a skilled system user	,085	-,074	-,086	**,284**
I find the system easy to use	,130	-,235	,009	-,174
Learning how to use the system is easy for me	,109	-,131	,024	,112
The people I relate to think I should use the system	**-,376****	-,221	-,167	,115
People who are important to me think I should use the system	-,193	,044	-,071	,231
Managers show that using the system is important to their reputation	,147	,256	-,214	,268
**. The correlation is significant at level 0.01 (bilateral).				
*. Correlation is significant at the 0,05 level (bilateral).				

Source: Elaborated by the authors based on research data

Thus, it can be observed in Table 11 regarding the perception of the men, that there is a correlation between age and the manager's perception that the system allows them to perform tasks more quickly. There is a weak correlation between age and the use of the system to perform activities more quickly. It suggests what male managers with lower age do not understand that the system allows them to perform tasks more quickly.

Another point is that the correlation between management time and the interaction with the system is clear and understandable. In this case, especially for male managers, there is a negative correlation when the proposition suggested that the less time spent in management, the less the manager perceives when the interaction with the system is clear and understandable. This fact may demonstrate that there should be better training for those who are starting in management since they may present more difficulties in operating the Indicator Panel and how to use it for their decision-making process.

A prominent point in the comparison between male and female managers is that male managers perceive that they can become a skilled user of the Indicator Panel. One the other hand, female managers presented a positive correlation concerning the proposition, demonstrating that female managers have a better perception that they can become skilled users in the handling of the tool, different from male managers who presented insignificant correlation value.

Finally, corroborating with the graphs already presented, there is a significant negative correlation between men's age and the perception that the people with whom they relate think they should use the system. In this situation, it can be analyzed that male managers with minor age do not consider the evaluations of the people with whom they relate regarding the use of the system.

5. Conclusion

This research aimed to analyze the perception of managers regarding the use and acceptance of Decision Support Systems (DSS) at the Federal Institute of Education, Science, and Technology in Rondônia. The DMS used by the institution is called the Panel of Indicators and aggregates several elements that allow the user to have access to information that can contribute to the decision-making process.

Based on the application of the UTAUT Model, the Exploratory Factor Analysis (EFA) was performed, and the results of the first tests allowed simplifying the model, generating three preponderant factors for the use and acceptance of the Indicator Panel: Effort Expectation, Performance Expectation, and Social Influence factors. It is worth mentioning that the "Facilitating Conditions" construction was removed for not reaching the adequate reliability level.

The reduction demonstrated that the factors pointed out here explain 77.33% of the acceptance and intention of use, similar to the result found by Venkatesh et al. (2003), where the UTAUT Model explained 70% of the intention of use variation.

Besides, the results showed that managers understand the system is useful for their work, with 76% affirmation, and that it is important for the institution. However, although 80% of them use a decision support system, only 50% use the Indicators Panel. It suggests that managers agree that the system is useful

for their work, but the effort expectation, which is clear and understandable interaction with the system, presented contradictions. It allows the inference that despite the importance of the system in supporting decision making and managers' perception of contributions to the decision-making process, interaction with the system does not occur clearly and understandably.

It is noteworthy that the results presented do not change from the experience, gender, and age for the use of the system and is consistent with the studies of Zaragoza and Domingues (2013), in which the variables also did not affect the intention of use. Thus, it can be inferred that both female and male managers have the same understanding of the Panel of Indicators for the institution.

After analyzing the propositions of the Effort Expectation Factor, it was possible to verify that the interaction with the system is not clear and understandable enough for managers. However, most managers consider that it is easy to become a skilled user, learn how to use the system, and use the system. It suggests that if there is adequate training and/or disclosure by the institution about the importance of the tool, updating data and new features could improve the use of the decision-making process.

Related to the UTAUT model, it is perceived that being a public institution may suggest that the use of the system and the expectation of performance is linked to easing of use and improvement in the execution of activities and increased productivity than other propositions. Concerning social influence, it is perceived that the systems´ acceptance and use are related to the support of the institution and that the relationship with people does not have high adherence to agreement for use and acceptance of the system.

The non-significance of the "Social Influence" construct may be the fact of the voluntary use of the system for decision making. According to Venkatesh et al. (2003), Social Influence is more significant in environments where the use of a system is mandatory, so such a construct may not show importance.

Finally, the importance of a tool such as the IFRO Indicator Panel as a Decision Support System can be proven, and it is evident that in today's world, the faster information is available and more visible to the user tends to be more productive.

The present study sought contributions to the research of the subject under investigation. As a theoretical contribution, this research relates to the application of the UTAUT Model in a Decision Support System, specifically the IFRO Indicator Panel. From a practical point of view, the study will help the institution to understand the aspects that influence the adoption and use of the Panel of Indicators as a Decision Support System and thus plan actions and discussions for its adoption.

In the field of methodology, the contribution of this study was made through the use of paraconsistent logic associated with factor analysis and the average ranking differing from studies that usually use structural equation modeling.

Concerning the limitations of this study, there is a possible bias of the managers, since the Indicator Panel is an institutional instrument.

Thus, it is suggested that for future researches, a direct approach to participants in a qualitative way be carried out in order to seek a more detailed clarification on the use and acceptance of decision support systems, as well as to investigate the influence of other constructs.

6. References

AJZEN, Icek. *The theory of planned behavior*. Organizational Behavior and Human Decision Processes, v. 50, n. 2, p. 179–211, Dez 1991.

ALBERTIN, A. & ALBERTIN, R. M. de M. *Benefícios do uso de tecnologia de informação para o desempenho empresarial*. Revista de Administração Pública, v. 42, n. 2, p. 275–302, 2008.

BABBIE, Earl. *Métodos de Pesquisa de Survey*. Editora UFMG, 2003.

BIDGOLI, H. *Decision Support System – Principles and Practice*. West Publishing Company, 1989.

BISPO, C.A.F. *Uma análise da nova geração de sistemas de apoio à decisão*. Dissertação de Mestrado. Escola de Engenharia de São Carlos, 1998.

BOBSIN, D., VISENTINI, M S, & RECH, I. *Em busca do estado da arte do UTAUT: ampliando as considerações sobre o uso da tecnologia*. Revista de Administração e Inovação, v. 6, n. 2, p. 99–118, 2009.

BRASIL. *LEI Nº 11.892, DE 29 DE DEZEMBRO DE 2008*. Casa Civil, 2008. Retrieved from http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2008/lei/l11892.htm

BRASIL, IFRO. *Plano de Desenvolvimento Institucional (PDI) - IFRO (2014 - 2018)*. 2014. Retrieved from http://estrategia.ifro.edu.br/pdi/wp-content/uploads/sites/6/2015/03/pdi-ifro-2014-2018-versao-final-corrigida.pdf

BRASIL, IFRO. *Plano de Desenvolvimento Institucional 2018-2022*. Porto Velho, Rondônia, 2018.

CLERICUZI, A., ALMEIDA, A. T., & COSTA, A. P. C. S. *Aspectos relevantes dos SAD nas organizações: um estudo exploratório*. Produção, v. 16, n. 1, p. 8–23, 2006.

COMPEAU, D. R., & HIGGINS, C. A. *Computer Self-Efficacy: Development of a Measure and Initial Test*. MIS Quarterly, v. 19, n. 2, p. 189, Jun 1995.

COSTA, P. W. A. *Como surgiram os data warehouses?* Computerworld, 03 nov. p. 16. 1997.

COOPER, D. R., & SCHINDLER, P. S. *Métodos de pesquisa em administração*. 7. ed. Porto Alegre: Bookman, 2003.

CORRAR, L. J., PAULO, E., & DIAS FILHO, J. M. *Análise Multivariada para os cursos de Administração, Ciências Contábeis e Economia*. Editora Altas, 2014.

COURTNEY, J. F. *Decision making and knowledge management in inquiring organizations: toward a new decision-making paradigm for DSS*. Decision Support Systems, v. 31, n. 1, p. 17–38, 2001.

CRESWELL, J. W. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications, 2009.

DAVIS, F.D., BAGOZZI, R.P., & WARSHAW, P.R. *User acceptance of computer technology: a comparison of two theoretical models*. Management Science. V. 35, n. 8, p. 982-1003, 1989.

DAVIS, F. D. *Perceived Usefulness, Perceived Ease Of Use, And User Acceptance*. MIS Quarterly, v. 13, n. 3, p. 319–339, 1989.

FARIA, L. H. L., GIULIANI, A., PIZZINATTO, N., & PIZZINATTO, A. *O Modelo Estendido da Teoria Unificada da Aceitação e Uso de Tecnologia no Contexto do Consumo (UTAUT2): Avaliando o Modelo no Brasil a Partir de Usuários de Internet em Smartphones*. Revista de Administração da Universidade Federal de Santa Maria, v. 7, n. 2, p. 332–348, 2014.

FISHBEIN, M., & AJZEN, I. *Belief, Attitude, Intention and Behavior.* Reading: Addison-Wesley, 1975.

PEARSON, J. M., & SHIM, J.P. *An empirical investigation into DSS structures and environments*. ScienceDirect, V. 13, Issue 2, Pages 141-158, 1995.

GIL, A. C. *Como Elaborar Projetos de Pesquisa*. 4. ed. São Paulo. Editora Atlas, 2002.

GOMES, C. G., NEGRÃO, K. R. M., LIMA, T. S., MARTINS, C. M., & CARVALHO, M. C. S. *Adoção de tecnologia da informação como estratégia para melhorar o desempenho da gestão de micro e pequenas empresas*. Revista de Micro e Pequenas Empresas e Empreendedorismo da Fatec Osasco, v. 5, jan.-jun. 2019.

GUIMARÃES, E. M. P., & ÉVORA, Y. D. M. *Sistema de informação: instrumento para tomada de decisão no exercício da gerência*. Ciência da Informação, v. 33, n. 1, p. 72–80, 2004.

HEINZLE, R., GAUTHIER, F. & FIALHO, F. *Semântica nos sistemas de apoio a decisão: o estado da arte*. Revista da Unifebe, v. 8, p. 1–20, 2010.

HORA, H. R. M., MONTEIRO, G. T. R., & ARICA, J. *Confiabilidade em questionários para qualidade: um estudo com o coeficiente alfa de Cronbach*. Produto & Produção, v. 11, n. 1973, p. 85–103, 2010.

LARIEIRA, C. L. C., & ALBERTIN, A. L. *Um estudo sobre os fatores organizacionais que influenciam a gestão de portfólio de projetos de tecnologia da informação e comunicação.* REAd, v. 81, n. 2, p. 515–547, 2015.

LAUDON, K, & LAUDON, J. *Essentials of MIS*. 13th ed. Pearson, 2018.

MALHOTRA, N. *Marketing Research: An Applied Orientation*. 7th. ed. Pearson, 2018.

MOREIRA, J R, BRUNO, J, & RIBEIRO, P. *Necessidade de Informação e Tecnologia da Informação e Comunicação: Ensaio sobre uso e necessidade de informação para alinhamento estratégico entre TIC e Negócios*. n. 1979, p. 1–5, 2014.

MOURA, W. M., LIMA, A. M., PINTO, R. G. S., & ROCHA, M. G. S. *Benefits of information technology for the business strategies: an integrative review*. v. 3, n. 4, p. 732–739, 2017.

PEARSON, J. M., & SHIM, J.P. *An empirical investigation into DSS structures and environments*. ScienceDirect, V. 13, Issue 2, Pages 141-158, 1995.

PORTO, C. & BELFORT, A. *Introdução ao Planejamento Estratégico Institucional.* ENAP, 2001.

ROGERS, E. M. *Diffusion of innovations.* 5th ed., Free Press. 2003.

SANCHEZ, L. H. A., SANCHEZ, O. P., & ALBERTIN, A. L. *GESTÃO DE RECURSOS DO EAD: COMO ADEQUAR AS TECNOLOGIAS AOS PERFIS DE ASSIMILAÇÃO*. Revista de Administração de Empresas, v. 55, n. 5, p. 511–526, 2015.

SANTA, E. D., MUSSI, C. C., & NASCIMENTO, G. *Uso da Tecnologia da Informação e Desempenho do Serviço de Transporte Rodoviário de Cargas*. Revista Gestão & Tecnologia, v. 16, n. 1, p. 201–233, 2016.

SARAGOÇA, V. A. M.; DOMINGUES, M. J. C. DE. Fatores que influenciam o uso e a intenção de uso das tencologias: um estudo em uma universidade. Encontro da ANPAD, v. 37, 2013.

SILVA, B. S., MELO, M. C., RIBEIRO, M. D. A., & BORGES, L. *Sistemas de apoio a decisão médica (SADM).* Revista Eletrônica de Sistemas de Informação e de Gestão Tecnológica, v. 3, n. 1, 2013.

SILVA FILHO, J. I. *Lógica Para Fuzzy – Um método de Aplicação da Lógica Paraconsistente e Fuzzy em Sistemas de Controle Híbridos*. Revista Seleção Documental, v. 2, p. 16–24, 2009.

SILVA, R. A., SILVA, F. C. A., & GOMES, C. F. S. *O USO DO BUSINESS INTELLIGENCE (BI) EM SISTEMA DE APOIO À TOMADA DE DECISÃO ESTRATÉGICA*. Revista Gestão Inovação e Tecnologias,

v. 6, n. 1, p. 2780–2798, 2016.

SIMON, H. A. *Theories of decision-making in economics and behavioral science*. The American Economic Review, v. 49, n. 3, p. 253–283, 1959.

TAYLOR, S., & TODD, P. A. *Understanding information technology usage: A test of competing models*. Information Systems Research, v. 6, n. 2, 1995.

THOMPSON, R. L., HIGGINS, C. A., & HOWELL, J. M. *Personal Computing: Toward a Conceptual Model of Utilization.* MIS Quarterly, v. 15, n. 1, p. 125, 1991.

VENKATESH, V., MORRIS, M., DAVIS, G., & DAVIS, F. *User Acceptance of Information Technology: Toward a Unified View*. MIS Quarterly, v. 27, n. 3, p. 425–478, 2003.

VENKATESH, V., THONG, J. Y. L., & XU, X. *Unified theory of acceptance and use of technology.* Journal of the Association for Information Systems, v. 17, n. 5, p. 328–376, 2016.