Impact of technophilia and the guiding supports during use on the practical and social acceptability: example of a robotic programming software

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ABSTRACT

The objective of this study is to investigate the social acceptability and practical acceptability of an industrial robotic programming software for operators. Following a user-centered design approach, a user test of the software was conducted with sixteen operators. These operators were divided according to their technophilia and the guidance support in the use of the software. Measures of effectiveness, efficiency and satisfaction were carried out to measure practical acceptability on the one hand, and a modified Unified Theory of Acceptance and Use of Technology (UTAUT) model was used to measure social acceptability on the other hand. For the practical acceptability, the results show that technophilia would impact satisfaction, while the guidance supports would have an influence on the operator's efficiency. Concerning the social acceptability, a model of social acceptability of an industrial robotic programming software has been realized. From these results, research perspectives are established in order to improve the acceptability of the software and to investigate its acceptance after its implementation.

Author Keywords
Technology acceptance; acceptability; user-centered design; robotics; ergonomics

ACM Classification Keywords
H5.2. User Interfaces: Ergonomics; H5.2. User Interfaces: User-centered design; H3.4. Systems and Software: Performance evaluation (efficiency and effectiveness); D.2.8 Metrics: Performance measures

General Terms
Human Factors; Design; Measurement.

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1. INTRODUCTION

Automation leads to new work logics in industries. The robot carries out tasks in place of the operator, who will adjust some variables related to the robot's activity [9]. The operator thus becomes an “assistant to the technique” [9] and must comply to a cadence, sometimes lower than when he carried out his activity alone. All of this leads to working conditions that can be perceived as degraded, in the sense that the operator can no longer organize his work activity as he wishes and regulate it according to unforeseen events (*e.g.,* absence of a colleague). He may then feel dispossessed of his work activity and, consequently, suffer from psychosocial risks (*i.e.*, feeling of uselessness, stress, etc.) [9]. Robots are programmed for a particular production line. In case of change, they cannot be directly reprogrammed by the operators as expert knowledge and know-how are required. This aspect thus leads to a loss of control over their work and a feeling of self-depreciation.

To meet those challenges, the company Tesseract Solutions is developing, in partnership with a French psychology laboratory (CRP-CPO), a robotic programming software called KMeleon. This system aims to allow operators to control a robotic arm, without having to have any robotic programming skills. The software takes care of transcribing the actions performed in the software by the operator into lines of code that can be understood by the robot. These lines of code are hidden by the interface, but remain accessible to engineers who wish to immerse themselves more deeply in

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the workings of KMeleon. Thus, this software has the ambition to allow workers to perform robotic programming, without the need to mobilize programming skills. Furthermore, KMeleon is adapted to several brands of robotic arms (*i.e.*, Universal Robots, FANUC, Stäubli, etc.), which allows it to offer a universal interface, unlike robotic arm brands that have a brand-specific interface.

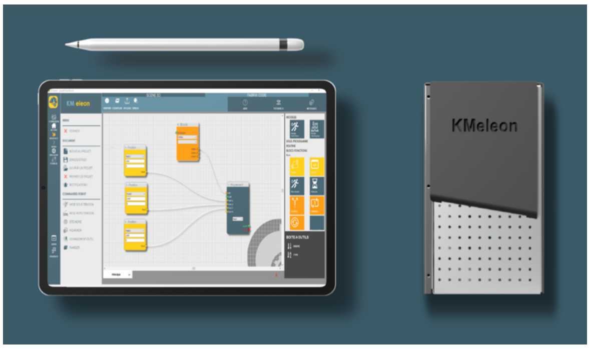

Figure 1: Left, KMeleon on a tablet screen; right, the KMeleon Box

Despite numerous studies on emerging technologies in ergonomics, the safety criteria of these technologies are much more studied than their acceptability in design and implementation [10]. Therefore, the KMeleon software is designed according to a user-centered design perspective [19], in order to match the expectations, needs and requirements of operators. The aim of this paper is to present an evaluation of the practical and social acceptability [7, 8] of a KMeleon prototype by operators (*i.e.*, step 4 of user-centered design). In the next section, we present the main theories related to the practical and social acceptability of technologies. Then, we present our methodology for data collection and we propose our analysis method based on a statistical approach. We conclude with future studies in ergonomics.

2. BACKGROUND

2.1. Practical acceptability

Practical acceptability asks about "what our interactions say about our ability to act" [8]. It is about understanding and improving the relationship between the individual, his task and his artefact [25] through ergonomic criteria, such as usefulness and usability. Usability can be defined as "the degree to which a system, product or service can be used, by specified users, to achieve defined goals with effectiveness, efficiency and satisfaction, in a specified context of use" [18]. Three components of usability emerge from this definition: (1) effectiveness defined as "accuracy and degree of completion with which the user achieves specified goals" [18], (2) efficiency defined as "the relationship between resources used and results achieved" [18] and (3) satisfaction defined as "the degree to which the user's physical, cognitive and emotional responses resulting from the use of a system, product or service meet the user's needs and expectations" [18]. To measure practical acceptability in a user test, performance measures such as the number of errors to measure effectiveness, time to measure efficiency and a questionnaire to measure satisfaction (*e.g.*, System Usability Scale) can be mobilized [12].

2.2. Social acceptability

Social acceptability has a psycho-sociological orientation. It questions what our intentions imply about our willingness to act' [8]. More specifically, it is a question of measuring the subjective representation that future users have of the proposed technology before its use. Moreover, once these same users have adopted a technology use behavior, their representations will evolve. Social acceptability thus inquiries into the usage intentions of users before and after usage. Many models are commonly used to investigate the social acceptability of a technology, such as the Technology Acceptance Model (TAM) [13]. The TAM is the most widely used acceptability model in the scientific literature [33], especially in its first version [10]. There is also the Unified Theory of Acceptance and Use of Technology (UTAUT) in its first [29] or second version [31]. This model explains 70% of the variance, which is better than the TAM [21]. The UTAUT2 [31] will thus be used in this study. This model includes seven criteria: (1) performance expectancy (PE), (2) effort expectancy (EE), (3) social influence (SI), (4) facilitating conditions (FC), (5) hedonic motivation (HM), (6) price value and (7) habits. The UTAUT2 includes moderators such as gender, age and experience. The set is thus able to predict behavioral intentions (BI) and to determine technology use behavior. Based on the work of Venkatesh et al. [30], Jawadi [20] adds two variables: volition (VOL) as a moderator of SI and expected behavior (BE) which is determined by BI.

2.3. Objective and assumptions

The aim of our study is to identify the impact of guidance materials and the degree of operator technophilia on the practical acceptability (measured by effectiveness, efficiency and satisfaction) and social acceptability (measured by UTAUT variables) of KMeleon by operators. From this objective, several research hypotheses are derived, which are described below.

Based on the theoretical elements discussed in section 2.1, it is assumed that (H1) effectiveness (EF), (H2) efficiency (EC) and (H3) satisfaction (SAT) are different depending on the media used. More specifically, it is postulated that EF, EC and SAT scores are higher when the operator performs a defined task with the support of a video or training with an instruction manual than when no support or an instruction manual is used. In addition, it is assumed that (H4) EF, (H5) EC and (H6) SAT are also different depending on the technophilia of the operators. Therefore, it is assumed that EF, EC and SAT scores are higher for operators with strong technophilia than operators with weak technophilia. These assumptions are summarized in Table 1.

Assumptions	Description
H1	EC ≠ media
H2	EF ≠ media
H3	SAT ≠ media
H4	EC ≠ technophilia
H5	EF ≠ technophilia
H6	SAT ≠ technophilia

Table 1: Assumptions about factors affecting practical acceptability

In the case of KMeleon's social acceptability, and considering the theoretical elements discussed in section 2.2, it is assumed that (H7) performance expectancy, (H8) effort expectancy, (H10) social influence and (H11) hedonic motivation are correlated to behavioral intention. Also, (H9) volition (VOL) would have an impact on SI. In addition, (H12) facilitating conditions (FC) would influence expected behavior and (H13) behavioral intention. It is also postulated that (H14) behavioral intention would influence expected behavior (BE).

In addition, the variables of job tenure (ANC), technophilia (TEC) [1] and computer anxiety (ANX) [26] were added to the UTAUT2. It is assumed that (H15) age (AGE), (H16) ANC, (H17) TEC and (H18) ANX correlate on all the BI determinants of the modified UTAUT2.

These assumptions regarding the social acceptability of KMeleon are summarized in Table 2.

Assumptions	Description
H7	PE → BI
H8	EE → BI
H9	VOL → SI
H10	SI → BI
H11	HM → BI
H12	FC → BE
H13	FC → BI
H14	BI → BE
H15	AGE → BI variables (FC, PE, EE, SI, HM)
H16	ANC → BI variables (FC, PE, EE, SI, HM)
H17	TEC → BI variables (FC, PE, EE, SI, HM)
H18	ANX → BI variables (FC, PE, EE, SI, HM)

Table 2: Assumptions about factors affecting social acceptability

These assumptions allow us to suggest a research model for the social acceptability of robotic programming software (see Figure 2).

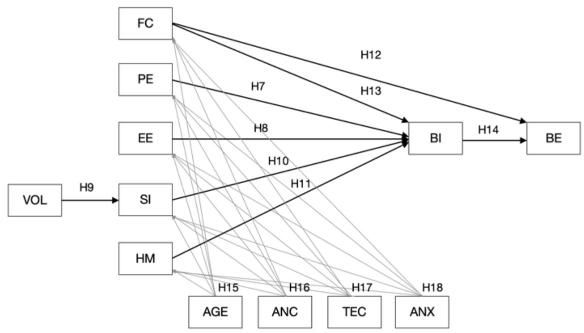

Figure 2: Modified UTAUT2 theoretical model

Performance expectancy is generally considered to be a measure of perceived usefulness. Thus, the assumptions that there will be a difference in PE between (H19) technophilia and (H20) media modalities of the participants are made.

Finally, it is assumed that intents to use are different as a function of (H21) technophilia and (H22) media. These assumptions are summarized in Table 3.

Assumptions	Description
H19	PE ≠ technophilia
H20	PE ≠ media
H21	BI ≠ technophilia
H22	BI ≠ media

Table 3: Assumptions for usefulness and intentions to use

3. METHOD

3.1. Participants

Sixteen male participants, aged eighteen to fifty-eight years ($M = 45$; $SD = 12.3$), were recruited from a French Industry 4.0 named APEGELEC. This sample consists of half of the factory's operators (*i.e.,* the target population for the future job in the factory). They were randomly allocated to the guiding support modalities (*i.e.*, no support, with manual, with video, with training), but were voluntarily allocated according to their self-reported technophilia (*i.e.*, with strong technophilia, with weak technophilia).

As mentioned in the previous hypotheses, the technophilia of the operators (i.e., 4 weak technophilia, 4 strong technophilia) and the supports (i.e., 2 no support, 2 with manual, 2 with video, 2 with training) are analyzed separately.

3.2. Experimental procedure and conditions

The operators are individually received in a room of the factory equipped with a UR3e collaborative robot (or cobot) and a computer screen to display the KMeleon software. Their objective is to perform a handling task (*i.e.,* picking up and putting down an object by the robot) in fifteen minutes using KMeleon. The operators performing the task are filmed, their screen contents are recorded and their verbatims are collected during the task execution and after the task during a debriefing.

Figure 3: Operator performing the handling task specific to the study

This task was performed in one of four conditions: "manual", "video", "training" and "no support". Video and training were designed for the experiment and the manual was already available. Specifically, the operators in the "manual" condition were provided with a seventy-page user manual. It contains a large amount of information for performing tasks of varying complexity on KMeleon, including a pick-and-place task. Operators in the "video" condition can play a training video on an iPad tablet. This video explains, step by step, how to perform a pick-and-place task. Operators in the training condition receive fifteen to twenty minutes of training just before the study. They have the opportunity to take notes throughout the procedure. At the end of the training, they are given a seven-page quick start guide for a handling task. Finally, the operators who were assigned to the "no support" condition were not equipped in any way to perform the handling task. The group without support was integrated in order to identify the acceptability of the software (*i.e.,* usability and usage intentions) without external help. It also allows us to understand the influence of supports on the acceptability of a robotic software.

3.3. KMeleon software and UR3e cobot

3.3.1. KMeleon

The KMeleon software was installed on a computer via the KMeleon Box, a box that allows a Windows operating system to be equipped with KMeleon integrated into a system (*e.g*., computer screen, touch tablet) by a simple plug-in.

3.3.2. Cobot

The UR3e cobot is used to carry out the studies, particularly because of its small size and ease of handling. It is a collaborative robot, in other words a supplementary technology [6] which, unlike conventional robots, can be manipulated manually through physical contact.

These characteristics thus facilitate human-robot interactions. This cobot is equipped with a robotic gripper that can pick up, move and drop an object from KMeleon.

3.4. Measures

3.4.1. Measure of technophilia

The degree of technophilia of the operators was measured by the four items of the Personal Innovativeness in the Domain of Information Technology by Agarwal and Prasad [1]. All items were measured using a seven-point Likert-type scale with anchors from "Strongly disagree" to "Strongly agree". These items are illustrated in Table 5.

Construct	Items
Personal Innovativeness in the Domain of Information Technology	If I heard about a new information technology, I would look for ways to experiment it. (PIIT1)
	Among my peers, I am usually the first to try out new information technologies (PIIT2)
	In general, I am hesitant to try out new information technologies. (PIIT3)*
	I like to experiment with new information technologies. (PIIT4)

Table 5: Items measuring the degree of technophilia, taken from Agarwal and Prasad [1]

Operators with a score between 1 and 14 are considered with weak technophilia and between 15 and 28 with strong technophilia.

3.4.2. Measures of practical acceptability

Practical acceptability is measured by usability, composed of effectiveness, efficiency and satisfaction [18]. Effectiveness is measured through the success or failure of the operator in the task. Abandonments are considered as failures. Efficiency is measured by the time taken to complete the task. The failures related to three dropouts were excluded from the data as they distorted the efficiency measure. Satisfaction is measured by the F-SUS [15], a French version of the SUS [11]. This ten-item questionnaire is particularly suited to industrial systems [11]. It is defined as "quick and dirty" by its author [11] because its administration is quick, simple to understand, offers a score that can be easily transmitted to sponsors and allows for the difference between good and bad systems [15]. The questionnaire also shows good reliability with a score of 0.85 obtained by Kirakowski [21] and 0.911 obtained by Bangor and *al*. [4]. This result is similar to other usability questionnaires [4], such as the After Scenario Questionnaire (ASQ) by Lewis [23] or the Software

Usability Measurement Inventory (SUMI) by Kirakowski and Corbett [22]. This questionnaire gives a satisfaction score out of 100. However, Bangor and *al*. [4] show that SUS scores tend to create positive results above 50.

It is therefore recommended to compare SUS scores to an average of scores obtained in the literature for the corresponding system [4]. For the same pick-and-place task, a mean SUS score of 47.75/100 was obtained on a non-expert population after the use of robotic programming software [14].

3.4.3. Measures of social acceptability

The UTAUT 2 questionnaire is used. It contains the classic UTAUT variables [30], such as PE, EE, SI, FC, HM. Only the price or habit variables were not taken into account as they do not apply to our study. In addition, the variables related to willingness and BE were added in agreement with Jawadi [20]. Socio-demographic variables related to age, seniority in the company, degree of technophilia and computer anxiety were considered. All these variables contain four items, except for BI which contains only three. All items were measured using a seven-point Likert-type scale with anchors from “Strongly disagree” to “Strongly agree”. Each variable therefore has a total score out of 28, with the exception of BI whose total score is 21. As PE is represented by usefulness, it will complement usability within practical acceptability.

3.4.4. Data analysis

The results were analysed using JAMOVI software (version 2.0.0.0). When the criteria for homoscedasticity (e.g., Shapiro Wilk normality test indicated a non-significant result: $p < 0.05$) were met, we used parametric tests (e.g., Fischer's ANOVA and Student's t-test), otherwise we used non-parametric tests (e.g., Kruskal-Wallis and Mann-Whitney tests).

4. RESULTS

4.1. Practical acceptability

There was no significant difference between medias and the effectiveness of the operators (Kruskal-Wallis: χ^2 (3, 14) = 7.5, p = .058). There was a significant difference in terms of efficiency (Kruskal-Wallis: χ^2 (3, 14) = 9.96, p = .019). Indeed, the operators in the “none” and “manual” conditions did not manage to complete the task in the allotted time of fifteen minutes, while three operators in the “video” condition and one operator in the “training and instruction” condition managed to complete the task in less than fifteen minutes. Thus, the operators in the “none” and “manual” conditions had an average time of 900 seconds, while the operators in the “video” and “training and instruction” conditions completed the task in an average of 716 and 867 seconds respectively. The ANOVA (Fischer) test does not admit any significant result between medias and the satisfaction of the operators (F (3, 12) = 3.03, p = .071). These results are described in Table 6.

	Media	Efficiency (EF)	Effectiveness (EC)	Satisfaction (SAT)
N	None	2	4	4
	Manual	4	4	4
	Video	3	4	4
	Training	4	4	4
Missing	None	2	0	0
	Manual	0	0	0
	Video	1	0	0
	Training and instruction	0	0	0
Mean	None	900	0.00	36.9
	Manual	900	0.00	37.5
	Video	716	0.750	66.3
	Training	867	0.250	64.7
SD	None	0.00	0.00	5.15
	Manual	0.00	0.00	19.7
	Video	26.7	0.500	23.3
	Training and instruction	66.0	0.500	21.3

Table 6: Descriptive results of EF, EC and SAT on media

The Mann-Whitney test shows a non-significant difference in effectiveness (U = 24, p = .295) and efficiency (U = 17, p = .655) for the technophilia modality. The Student t test shows a significant difference in satisfaction with user technophilia (t = 2.9, p = .012). Specifically, operators with strong technophilia showed an average score of 64.5 (SD = 22.6, range = 40-97.5) for the KMeleon software, while the score is 38.1 (SD = 12.3, range = 15-52.5) on average for operators with weak technophilia. These results are described in Table 7.

	Group	N	Mean	Median	SD	SE
Efficiency (EF)	Strong technophilia	8	836.375	900.00	90.557	32.017
	Weak technophilia	5	865.000	900.00	78.262	35.000
Effectiveness (EC)	Strong technophilia	8	0.375	0.0	0.518	0.183
	Weak technophilia	8	0.125	0.0	0.354	0.125
Satisfaction (SAT)	Strong technophilia	8	64.531	66.3	22.638	8.004
	Weak technophilia	8	38.125	38.8	12.302	4.349

Table 7: Descriptive results of EF, EC and SAT on technophilia

4.2. Social acceptability

Correlations were found between all variables in the UTAUT 2. Thus, PE (r = 0.637, p = .008), EE (r = 0.510, p = .044), SI (r = 0.765, p < .001), FC (r = 0.762; p < .001), BE (r = 0.845, p < .001) and MH (r = 0.770, p < .001) are significantly correlated to BI. VOL is correlated with all variables determining BI in UTAUT2. TEC is correlated with all UTAUT2 variables except for EP.

These correlations allow us to propose a model of social acceptability of a robotic programming software for a population of operators (see figure 4).

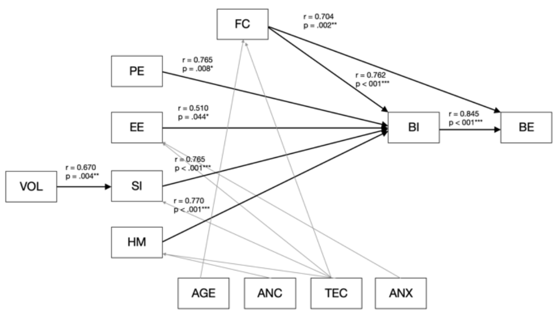

Figure 4: Social acceptability model of robotic programming software

Regarding the scores of perceived usefulness through PE, the ANOVA (Welch) shows no significant effect of PE on supports (F (3,6.48) = 1.36, p = .337). Student t shows no significant effect of PE on technophilia (t = 1.91, p = .077).

The ANOVA (Welch) shows no significant effect of BI on supports (F (3,6.21) = 0.499, p = .696) as shown in Table 14. Finally, Student t shows no significant effect of BI on technophilia (t = 1.36, p = .195). These results are described in Tables 8 and 9.

	Media	Performance Expectancy	Behavioral Intention
N	None	4	4
	Manual	4	4
	Video	4	4
	Training and instruction	4	4
Missing	None	0	0
	Manual	0	0
	Video	0	0
	Training and instruction	0	0
Mean	None	12.8	12.5
	Manual	8.75	8.00
	Video	13.8	10.8
	Training and instruction	17.5	10.0
SD	None	4.03	4.12
	Manual	6.40	5.83
	Video	8.38	7.63
	Training and instruction	5.00	2.58

Table 8: Descriptive results of PE and BI on media

	Technophilia	Performance Expectancy	Behavioral Intention
N	Strong technophilia	8	8
	Weak technophilia	8	8
Missing	Strong technophilia	0	0
	Weak technophilia	0	0
Mean	Strong technophilia	16.0	12.0
	Weak technophilia	10.4	8.63
SD	Strong technophilia	7.05	6.12
	Weak technophilia	4.44	3.42

Table 9: Descriptive results of PE and BI on technophilia

5. DISCUSSION

The aim of this study was to determine the practical and social acceptability of a robotic programming software called KMeleon according to the degree of technophilia of the participants (i.e., weak technophilia or strong technophilia) and to the different guidance materials during use (i.e., no support; with user manual; with training video; with oral training and written support).

With regard to practical acceptability, the statistical results allow us to validate two hypotheses. Firstly, the efficiency (EF) of an operator in performing a robotic program would be dependent on the support. It was found that a training video and, to a lesser extent, training with a short instruction manual could reduce the time required to perform a robotic pick-and-place task with KMeleon. The absence of support or a user manual lacks usability due to a lack of guidance. The information in the user manual is too much and not focused enough on the use cases, which is unpleasant for operators who want to perform a task efficiently and effectively. In contrast, the video and the oral training with a written start-up guide are targeted to the task at hand, which improves usability. Hypothesis (H2) is therefore validated. In the case of KMeleon, it seems that the operator is more effective with a video than with training and a manual instruction guide. However, these results do not corroborate the results of Alexander [2] on the use of a manual instruction guide and a video. Indeed, this author shows a better efficiency on the manual instruction guide, rather than the video. However, his sample watched the video a first time completely, and even a second time, before performing the task. In the case of this study, operators watched the video simultaneously with the task, including rewinding if they did not have time to perform the actions, which improved efficiency. These results may also suggest that there is a lack of efficiency of the instruction guide, delivered after the training to perform the task, for a non-expert population. This guidance material could therefore be improved through user testing [3]. Furthermore, it was established that operators with strong technophilia are more satisfied (SAT) than operators with weak technophilia in performing the task with KMeleon, which validates hypothesis (H6). This result is corroborated by a similar study on the practical acceptability of connected medical [12].

Importantly, unvalidated assumptions are also a valuable source of data for the design of KMeleon. It has been established that the efficiency in performing a task and the satisfaction of an operator in using a robotic would not depend on the supports that guide its use. Hypotheses H1 and H3 are therefore not verified. It would therefore be possible to deduce that a better efficiency and satisfaction of KMeleon should be sought in the design of its interface rather than in its guidance materials. In the same way, technophilia would have no impact on effectiveness (EC) and EF, which invalidates hypotheses 4 (H4) and 5 (H5) in accordance with the study by Chaniaud and *al*. [12].

Researchers conducted a similar study with 20 non-expert participants [14]. They had to program an industrial robot to perform a pick-and-place task similar to the study through two different interfaces: a 2D interface (i.e., comparable to KMeleon) and a mixed reality interface. The first interface obtained an average SUS score of 47.5/100, which is comparable to the results of our study (M= 51.33), while the second one obtained a score of 76.75/100. However, the robot used in this study is not collaborative (i.e., 7 degree of freedom robot arm), unlike our study which uses a collaborative robot that can be moved manually. In addition, the operators were given an explanation of the interface prior to the task and their technophilia was not differentiated, which does not allow for clear comparisons with our population. SUS scores may vary depending on whether the robot is collaborative or not, as well as on how the task is presented. However, mixed reality is considered as a design perspective to make the software more usable for non-technophiles.

Another study [5] was conducted with two groups (i.e., experts vs. non-experts). They had to program a collaborative robot to perform a pick-and-place with a natural language interface (i.e., as a chatbot) and a graphical interface (i.e., function blocks). The ten non-expert participants obtained an average SUS score of 80.25/100, while the experts scored 86.5/100. Differences with our study remain, especially in the procedure and in the interface itself, but allow to support some recommendations. Indeed, the development and implementation of a natural language interface could improve the guidance and, consequently, the usability of the software.

Regarding social acceptability, the main UTAUT variables (i.e., PE, EE, SI, FC, MH) are correlated with BI, which validates hypotheses H7, H8, H10, H11 and H13. These results corroborate those of the authors identified within the literature reviews and meta-analysis of UTAUT for PE, EE, SI, FC [31] and MH [27]. Moreover, VOL is correlated with SI, which validates hypothesis H9. FC and BI determine BE, which validates hypotheses H12 and H14 and corroborates the results of Jawadi [20]. On another side, technophilia has an influence on the intention-to-use variables of UTAUT2, except on PE, which partially validates hypothesis H17. AGE has only a significant relationship with FC, as does ANC with HM and ANX with EE, which does not fully validate hypotheses H15, H16 and H18.

Also, there would be no influence of the perceived usefulness, materialized by the PE, on the user's degree of technophilia or on the media used. Hypotheses H19 and H20 are therefore rejected. Similarly, these modalities would not influence the intention to use, which invalidates hypotheses H21 and H22.

To the best of our knowledge, no study uses the UTAUT to measure the social acceptability of robotic programming software. Most studies focus around robots (e.g., humanoids [28] or within an educational context [16 ; 17]), but not on the software interfacing between the human and the robot.

Finally, the verbatims collected after the requested task on KMeleon made it possible to determine that the operators of the "no support" and "manual" tasks generally indicated that the software lacked guidance. On the other hand, operators with video or with training and instruction explained that the software could be improved by limiting the number of steps to reach the goal and by grouping the steps in one clickable area. These recommendations will be taken into account when designing new solutions for KMeleon.

There are limitations, such as the small number of participants, which limits the scope of the results obtained. A first research perspective concerns the reproduction of this study on a larger sample in order to propose a statistically robust model and to generalise the results. In addition, evaluations integrating the user experience could have been carried out (e.g., AttrakDiff, meCUE) in order to complete the measures of practical acceptability limited in our study to usability criteria. A second perspective is related to the addition of user experience in further evaluations.

Finally, with the ambition of producing a software that is truly accepted by the final operators, a third research perspective concerns a longitudinal approach to the situated acceptance [7, 8] of KMeleon, in the sense of acceptance in use and by use, once it is implemented in the factory.

6. CONCLUSION

In a context where operators are often dispossessed of their work because of increasingly sophisticated tools, the evaluation of design solutions is an essential step in the user-centered design to determine the acceptability of a technological solution. It is indeed essential to give importance to the practical and social acceptability criteria of a technology specifically intended for the industrial field in order to give back power to the operators. Every designer has a social responsibility in the implementation of a tool in a workplace.

During this study, it was established that video support and training would allow operators to be more efficient in the first handling of a robotic software. It was also established that this software would cause greater satisfaction among the technophiles compared to the non-technophiles in our sample.

However, this should be seen in the light of the small sample size. The KMeleon software therefore needs to be improved in order to increase the overall efficiency and satisfaction felt by non-technophile operators. In addition, this study established a UTAUT2-based model for robotic software for industrial operators.

Finally, an operational contribution of this research work concerns the production of design solutions for the software (e.g., implementing training videos within the software, improving guidance by creating a wizard, etc.).

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