

Personalising Learning in Maltese - Exploring International Students' Expectations Towards Ġabra Online Lexicon

Jacqueline Żammit¹ & Patrick Camilleri¹

¹ University of Malta, Malta

Correspondence: Jacqueline Żammit, University of Malta, Malta. E-mail: jacqueline.zammit@um.edu.mt

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Abstract

The rapid incorporation of digital technologies in formal education has led to significant transformations, albeit not always yielding the anticipated productivity. This study investigates the attitudinal changes towards an online Maltese lexicon, Ġabra, among 46 adult learners of Maltese as a foreign language. By utilising a composite analytical model, the study is grounded in the theoretical frameworks of Technological Frames of Reference, the Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT). These frameworks guided the tracking of the development of respondents' attitudes over a five-month research period. The survey results gathered at the onset and conclusion of the study highlighted a perceptual discrepancy between the initial expectations towards an e-dictionary and the actual usage experience of the Ġabra platform. As the students gained more experience with the platform, their attitudes towards Ġabra underwent a shift. Despite some initial expectations not being fulfilled, the majority of students ultimately found Ġabra to be a beneficial tool for learning Maltese. The students' feedback about the Ġabra online dictionary can potentially pave the way for a more personalised learning experience of the Maltese language.

Keywords: rule-based system, online lexicon, attitudes, perceptions, Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, Technological Frames of Reference

1. Introduction

Education has traditionally mirrored or stimulated socio-economic development (Aoun, 2017). However, with the advent of the Fourth Industrial Revolution, it has become apparent that the digital revolution has not yet fully transformed education systems, teaching methodologies, and learning in schools (Caena and Redecker, 2019). One potential solution to bridge this gap is the concept of Education 4.0, which emphasizes personalization and allows students to choose their own learning paths (Hussin, 2018).

In this context, an investigation was undertaken to understand the evolving perceptions of a group of international students learning Maltese as a second language. The study employed a rule-based lexicon, Ġabra, as a tool for this exploration. This study was grounded in the theoretical frameworks of the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which are widely recognized in the field of technology adoption/use (Koul and Eydgahi, 2017; Khan and Qudrat-Ullah, 2020). These models provide a robust theoretical framework for understanding how students' attitudes towards the Ġabra online lexicon develop over time, and how these attitudes influence their decision to use the platform. The aim was to identify and define the participants' perceptions towards the lexicon as a tool for learning the Maltese language. Additionally, it compared the users' perceptions of the technology before and after its use, underscoring the concept of personalised learning within Education 4.0.

2. Research Questions

The study sought to answer the following research questions:

- (1) How does the use of the Ġabra rule-based enabled lexicon influence users' perceptions and interpretations towards learning Maltese, given their preconceived attitudes towards using electronic devices such as PCs and hand-held devices for learning?
- (2) How do the inherent flexibility of the technology and the users' subjective contextual use influence their perceived outcomes of its employment?

The research questions formulated for this study tackle specific theory-driven concerns, such as how students' initial attitudes towards the Ġabra platform influence their intention to use the platform (based on TAM), and how students' awareness of the Ġabra platform influences their acceptance and use of the platform (based on UTAUT). These questions aim to provide a theory-driven explanation of the findings and align the study with the theoretical framework of technology adoption/use.

In this context, an investigation was undertaken to understand the evolving perceptions of a group of foreign-speaking students learning Maltese as a second language. The study employed a rule-based lexicon, Ġabra (pronounced 'Jabra' in English), as a tool for this exploration. The use of the Ġabra lexicon facilitated the recording of feedback, potentially enabling a more personalised learning experience by allowing students to evaluate the quality and validity of the technology, and determine 'how,' 'if,' and 'when' to use it. The feedback provided by the participants about the learning platform while learning the Maltese language also served as valuable input for enhancing the platform itself. Thus, the technology played a crucial role in facilitating the data collection and analyzing the learning performance and progress of the participants.

Consequently, the use of the Ġabra lexicon can be viewed as a blend of experimental and precision learning approaches, leading to a dual-faceted research approach. As depicted in Figure 1 below, the rule-based system was initially employed to assist students in learning Maltese. Subsequently, the recursive dialogues between the users' agency and the perceptual modifications towards the traits of the employed technology contributed to improving the quality of the technology-in-use.

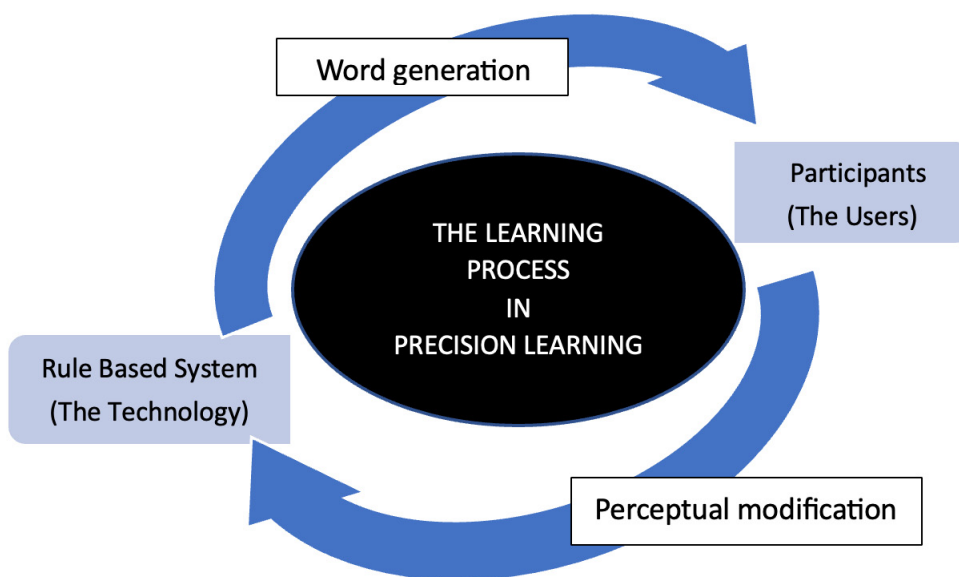


Figure 1. The Recursive action between Users' interpretations and the Rule-Based System

3. Literature Review

3.1 Ġabra System: A Rule-Based Dictionary

Ġabra is an online Maltese-English-Maltese dictionary that was initially developed as part of a morphological Master's thesis project in 2013 by John Camilleri (Camilleri, 2013). Today, it is a free and open dictionary for Maltese that was developed by collecting different lexical tools in a shared database (Żammit, 2022).

The Ġabra system is rule-based enabled and has a grammatical framework that functions by extracting patterns from a given dataset (Turner, 2019). However, there are instances where the rule-based system generates non-existent words. As such, students and educators are involved in correcting such errors. The Ġabra system currently comprises 19,470 entries and 4,514,679 inflective word forms that are mostly root-linked, providing translations in English and marked by different morphological characteristics. The words and their meanings were gathered from different sources, including dictionaries and grammar books (Żammit, 2022). One can search for a word from Ġabra by pressing "Root Search" at the top of the web page and writing its root or derivative form. Another method for retrieving a word is by writing the word itself. The Ġabra system is constantly updated, providing opportunities to change or add some words (Żammit, 2022).

3.2 The Users' Attitudes

The study aimed to evaluate users' attitudes towards the rule-based system employed in the Ġabra lexicon for learning Maltese. This was accomplished through the application of the interpretive flexibility of technology. Orlikowski and Gash (1994) coined the term Technological Frames of Reference (TFR) to refer to the recursive dialogues that develop around users' perceptions towards the technology being used. TFR is built around the assumptions, knowledge, and expectations that people employ to give meaning to the technology in question and to outline developed frames.

The study classified TFR into three interrelated domains of categorization, namely The Nature of Technology, The Technology Strategy, and The Technology-in-use. The Nature of Technology refers to the attributes that users devote to the capabilities and functions of the technology in question, which directly relates to how it is currently being employed (Olesen, 2014). This links to the Technology-in-use, which is grounded within the working knowledge and assumptions that people currently embrace while using the technology. The Technology Strategy refers to the motivation or future vision underlying its implementation (Camilleri, 2021), and it is dependent on and articulated according to the current manner the technology is being employed.

Consequently, the study evaluated users' attitudes towards the rule-based system employed in the Ġabra lexicon for learning Maltese, using the TFR framework to understand the interpretive flexibility of technology. By comparing users' perceptions before and after using the system, the study provides valuable insights into the potential of rule-based systems in language learning and the importance of user interpretation in technology adoption.

Technological frames are best defined and situated in the specific contexts in which they are developed and used (Camilleri, 2021). However, as Davidson (2006) argues, frames are susceptible to testing of perceptions and opportunities for comparison. As a result, Camilleri (2021) suggests that frameworks should be examined over time. Therefore, an additional analytical model, such as the Technology Acceptance Model (TAM), was applied to gain further insights into changes in attitudes and motivations towards technology. Hence, the comparison of initial and final perceptual snapshots separated by time led to the application of the TAM model, whose subdomain variables provided insights into the underlying processes that explained the differences in perceptions and attitudinal changes over time, as depicted in the diagram below.

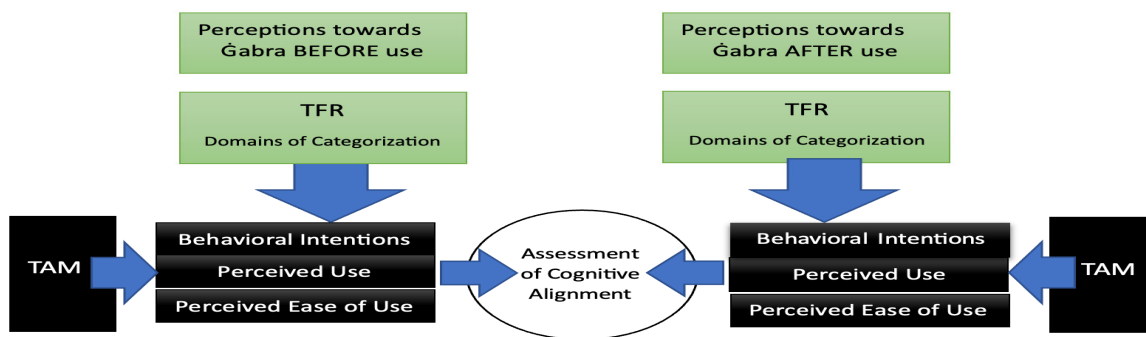


Figure 2. Assessing potential user attitudinal adjustments to the technology-enabled learning process (adopted from Camilleri, 2021)

Granić and Marangunić (2019) established that TAM has emerged as the leading scientific paradigm for investigating attitudes and motivations towards technology acceptance. TAM proposes that people accept or reject technology based on their perceptions (Scherer and Teo, 2019). Over time, TAM has accredited additional constructs to its core principles, such as the establishment of the Unified Theory of Acceptance and Use of Technology. As the abundance of research employing TAM in its analysis confirms, the model provides a facility for defining users' motivations through underlying variables that construct the distinct outcome variable of 'the attitude for use of the technology' (Granić and Marangunić, 2019; Scherer and Teo, 2019). As mentioned by Granić and Marangunić (2019), as well as other scholars, the variables for TAM can be defined as follows:

- (1) Perceived Ease of Use (PEoU) refers to how easy it is for a person to learn and use a particular technology. It includes the degree to which a person believes that using the technology would be effortless.
- (2) Perceived Usefulness (PU) is a measure of the extent to which a person believes that using a particular

system would improve their job performance. It is a predictor of the intention to use a technology.

(3) The PEOU and PU will influence the behavioural intentions of a person towards the technology, which will eventually influence their intention to use it.

(4) Behavioral intentions will be reflected in the observable attitude of use and the actual use of the technology. The attitude of use and the actual use are what can be observed through the use of the technology.

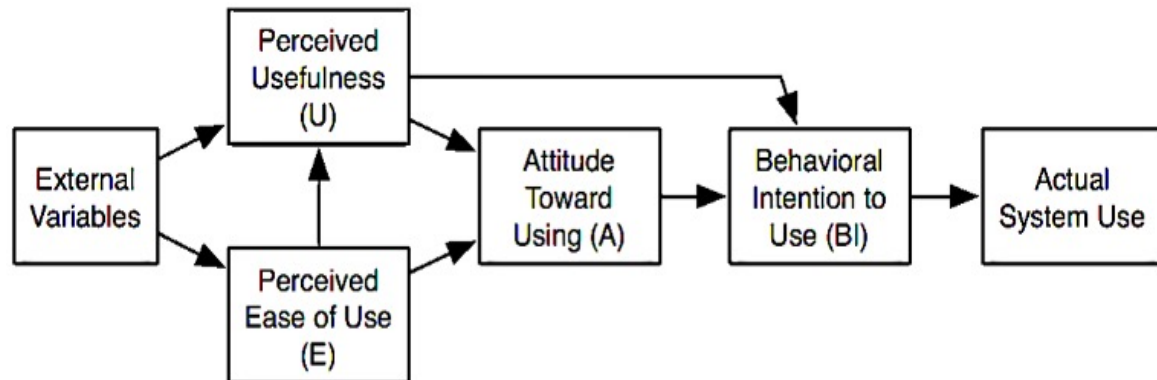


Figure 3. The Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989, p. 985)

Since all the variables in TAM revolve around *the attitude for using* (Scherer and Teo, 2019), TAM has proven to be a useful tool for effectively analysing observable outcomes. In this study, TAM has been employed to gauge variations in the nascent perceptions that users have developed and solidified their understanding of the rule-based enabled platform.

4. Methodology

4.1 Research Design

The study aimed to explore the effectiveness of an experimental rule-based enabled lexicon for international adult students learning Maltese. The research was grounded in the belief that knowledge and reality are socially constructed and influenced by individual beliefs and habits (Korte & Mercurio, 2017). Thus, the study adopted a pragmatist epistemology to embrace a pluralist understanding of multiple truths regarding the participants' perceptions of the rule-based enabled platform. To achieve this goal, a mixed research method was employed, involving the collection and analysis of both qualitative and quantitative data through two online questionnaires. Specifically, a sequential and explanatory strategy was used, where the quantitative approach served as the primary technique, and the qualitative method was used to provide explanations for observed quantitative data, serving as a secondary method.

4.2 Data Collection and Participants

In the current research, data was collected from students through the use of surveys/questionnaires. The emergence of the COVID-19 pandemic necessitated the adoption of an online method for data collection. The distribution of these online surveys was facilitated by 11 teachers of the Maltese language, who then disseminated them to their adult students. This strategy is indicative of purposive sampling, a non-probability sampling technique that deliberately selects individuals or groups with characteristics relevant to the research question (Palinkas et al., 2015). This method was particularly suitable for the study as it focused on a specific group of students studying Maltese at an Intermediate (B2) Level, a group that is inherently limited in size. Despite the smaller sample size, the findings are believed to be representative of this group and provide valuable insights for the research. Measures were also taken to ensure the validity and reliability of the findings, including the use of triangulation, maintaining a clear audit trail, and practising reflexivity throughout the research process.

4.3 Survey Development

The survey was developed with the specific aim of understanding the effectiveness of the rule-based enabled lexicon for international adult students learning Maltese. This aligns with the view that surveys are among the most widely used tools in research impact evaluation, providing a broad overview of the status of a body of research and supplying comparable, easy-to-analyze data (Solans-Domènech, et al., 2019).

The questions were carefully designed to capture both qualitative and quantitative data, providing a comprehensive view of the students' perceptions and experiences. This approach is consistent with the systematic

process of survey research design suggested by Vomberg and Klarmann (2022), which helps investigators organize and structure survey development by answering guiding questions for each stage of the survey research process.

The survey included a mix of multiple-choice, Likert scale, and open-ended questions to capture a wide range of responses. Multiple-choice and Likert scale questions were used to obtain quantitative data that could be easily analyzed and compared, while open-ended questions were used to gather qualitative data that could provide deeper insights into the students' experiences and perceptions (Vomberg and Klarmann, 2022).

The development of the survey was guided by the principles of transparency and accountability, as suggested by Guthrie et al. (2013). This involved ensuring that the survey questions were clear, unbiased, and relevant to the research question. The survey was also designed to be user-friendly, with clear instructions and a logical flow of questions to encourage participation and honest responses (Vomberg and Klarmann, 2022). The survey development process was rigorous and systematic, guided by established research principles and practices. This ensured that the survey was a valid and reliable tool for gathering data on the students' perceptions and experiences of the rule-based enabled lexicon.

4.4 Piloting and Validation Process

The piloting process was a crucial step in the survey development. It involved testing the survey with a small group of participants who were similar to the target population (Malmqvist et al., 2019). The survey was piloted with a group of 15 international students of Maltese. The purpose of this pilot testing was to identify any potential issues or errors in the survey instrument (Malmqvist et al., 2019). This included unclear or ambiguous questions, technical issues with the survey platform, or problems with the survey's length or flow (Pearson et al., 2020).

Feedback from the pilot group was then used to make the necessary modifications to the survey. This iterative process of testing and refining the survey helped to enhance its validity (the extent to which the survey measured what it was intended to measure) and reliability (the consistency of the survey's results over time) (Pearson et al., 2020).

4.5 Validation Process

Once the survey was revised based on the pilot testing, it was then reviewed by a panel of experts in the field. This is a common practice in survey research to further ensure the survey's validity (Swanson and Cole, 2022). The experts provided important insights and feedback on the survey's content, structure, and design, and helped to ensure that it was appropriate, relevant, and clear for the target population (Swanson and Cole, 2022).

4.6 Qualitative Analysis

The qualitative data collected from the open-ended questions in the survey were analyzed by using thematic analysis. According to Aspers and Corte (2019), qualitative research is an iterative process in which an improved understanding of the scientific community is achieved by making new significant distinctions resulting from getting closer to the phenomenon studied. This aligns with the present study's approach of reading through the responses multiple times to identify themes and patterns. These themes were then coded and categorized by Nvivo to provide a structured understanding of the data.

Furthermore, Yadav (2021) emphasizes that qualitative research allows for a deeper understanding of the subject matter, as it can capture nuances and complexities that quantitative research may overlook. This is evident in the current study, as the qualitative analysis helped to provide deeper insights into the students' experiences and perceptions, complementing the quantitative data.

4.7 Methodological Rigor

Methodological rigor is a critical aspect of any research study. It refers to the strict adherence to a set of standards or guidelines that ensure the reliability, validity, and generalizability of research findings (Reichlin et al., 2016). In the current study, several strategies were employed to enhance methodological rigor.

One such strategy is the triangulation of data, which involves using multiple sources or methods to cross-verify the findings. This approach increases the credibility and validity of the results by confirming the findings from different perspectives (Reichlin et al., 2016). According to Tobin and Begley (2004), triangulation is a tried and tested means of offering completeness, particularly in mixed-method research.

Lastly, reflexivity was employed in the present study to minimize bias. Reflexivity involved the researchers in this study constantly questioning their assumptions and interpretations to avoid bias in their findings (Reichlin et al., 2016). This is a crucial aspect of qualitative research, as it helps to ensure that the findings are a true reflection of the data and are not influenced by the researchers' personal biases (Reichlin et al., 2016).

4.8 Analysis

To collect data from multiple participants simultaneously and analyze the numerical characteristics of the study, a questionnaire that included open and closed-ended items was deemed necessary (Rogers, 2018). As a result, the research inherently provided both quantitative and qualitative data. To ensure that readers understand the outcomes of the study, the researchers presented the quantitative research findings and numerical values in graphs.

The coding for the qualitative data involved labelling and organizing the dataset to identify different themes and the relationships that characterized them (Rogers, 2018). This process allowed for examination and interpretation of the data to understand what it represented. Codes that represented the same meaning were merged to form broader themes. These themes were analyzed using the thematic analysis technique, which allowed the researchers to identify, analyze and interpret patterns of meanings within the qualitative dataset to draw meaningful conclusions (Terry et al., 2017).

The questionnaires included questions about the demographic characteristics of the participants and the digital/personal devices they owned. However, the two questionnaires were primarily used to discern participants' technological frames before and after using the rule-based enabled platform. Any changes in perceptions, reminiscent of degrees of cognitive misalignments or adaptations, were gauged by comparing the traits identified before and after liaising with the Ġabra. The questions focused on two main dimensions, as defined by TFR and delineated through terminology in TAM:

- (1) The nature of the technology, characterized in TAM by users' PU and PEOU of the digital platform.
- (2) The technology-in-use was discerned through the behavioural intentions underlying the use or intended use of the lexicon, as defined by TFR and delineated through terminology in TAM.

5. Results

The first questionnaire was completed by 46 participants. The second was filled out by 39, indicating a decrease in the number of participants. Although both questionnaires focused on evaluating users' TFR, the second questionnaire was designed to collect more detailed feedback on the usability and user experience of the digital platform through use. This suggests that the researchers sought to obtain more detailed insights into users' perceptions of the platform.

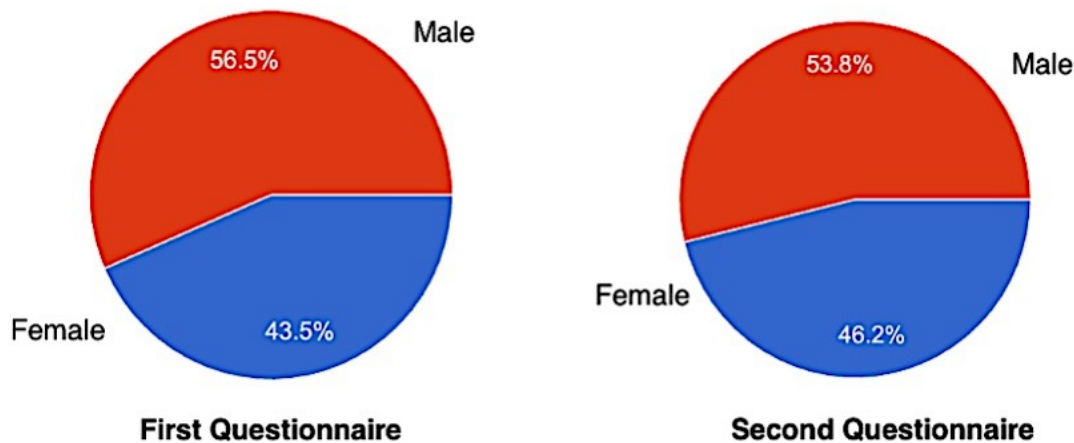


Figure 4. Distribution of Population by gender

Although not all participants completed both questionnaires, the gender distribution was similar in both samples, as shown in Figure 4. However, as shown in Figures 5 and 6 below, there was a difference in age distribution between the two questionnaires, with a higher proportion of respondents over 31 years old in the second questionnaire. Despite this difference, the largest group of respondents in both questionnaires remained between 31 and 40 years old. This suggests that the platform may be more appealing to an older age group, but further research would be necessary to confirm this trend.

First Questionnaire: Age. Group Distribution 46 Responses

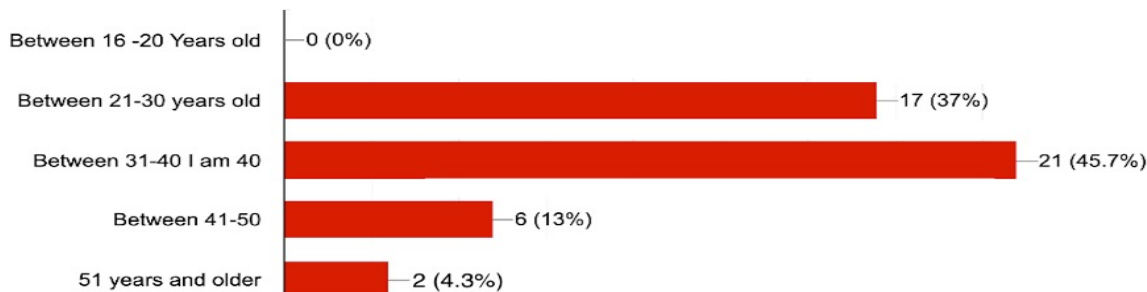


Figure 5. Group Distribution in the First Questionnaire

Second Questionnaire: Age. Group Distribution 39 Responses

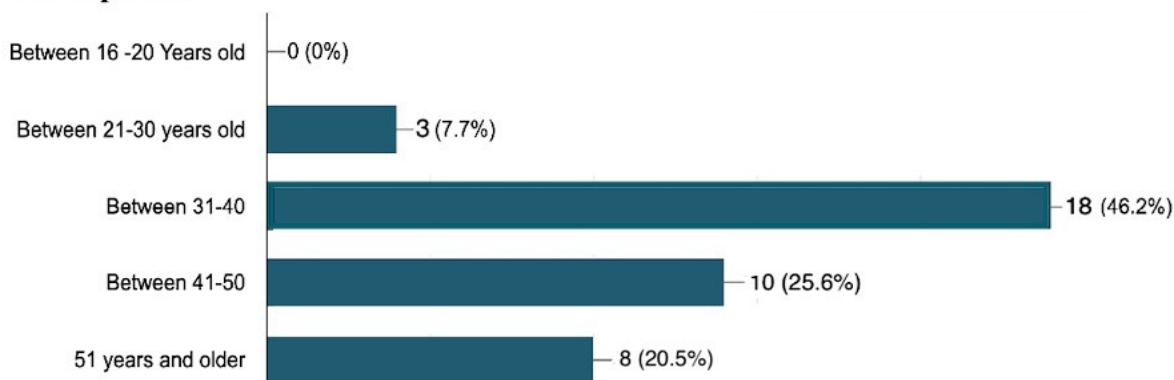


Figure 6. Group Distribution in the Second Questionnaire

5.1 The Nature of Technology: Perceptions towards Computers and their Use

All participants accessed the platform through computers. Therefore, notwithstanding the variety of readily available devices, the nature of the technology was assessed through the participants' perceived ease of use (PEoU) and the perceived usefulness (PU) of computers. Essentially, this was considered important because the inherent qualities of the computers may also have influenced the participants' perceptions of the Ġabra rule-based platform.

Regarding the participants' PEoU towards computers, the majority of respondents (96%) reported that they worked well or relatively well with their computers, while 4% reported having some difficulties. This suggests a high level of comfort and familiarity with computer technology among the surveyed group.

I use computers every day, and I find them very easy to use. I use my laptop for work, and my phone for personal use.

(Participant 9)

Participant 9 talked positively about how computers are an integral part of students' daily routines. They use a laptop for work and a phone for personal use, indicating that they differentiate between the devices based on their specific purposes. This suggests that participants have developed an understanding of how different devices can be used for different tasks, and have adapted their use of technology accordingly.

In terms of PU, almost all participants (97.8%) expressed that computers were essential in their lives.

I don't know what I would do without my computer. It's my main tool for work, communication, entertainment, and everything in between.

(Participant 3)

Participant 3 illustrated how computers have become an indispensable part of their life, and how they rely on computers for various purposes. The participant's statement also reflects the high level of PU associated with computers among the surveyed group. In general, the participants had a positive perception towards computers and their use and perceived them as essential tools in their daily lives. However, some participants expressed a negative or neutral attitude towards computers and their use. They reported having frequent problems with computers, finding them difficult to use, or not very useful or valuable in their life. They also indicated a low level of PU, as they only used computers when necessary or occasionally, and favoured other alternatives or did not care much about them.

I hate computers. They are always slow, buggy, and complicated. I only use them when I have to, and I prefer to do things manually or with other devices.

(Participant 15)

Computers are not that important to me. I use them occasionally, but I don't think they make a big difference in my life. I can easily live without them, and I don't see why they are so hyped up.

(Participant 27)

These participants showed a negative or indifferent perception of computers and their use, which may have also affected their level of interest and motivation with the Ġabra rule-based platform.

5.2 Comparing the Perceived Usefulness of Ġabra Online Dictionary

This study aimed to compare the PU of Ġabra online dictionary before and after using it, to learn Maltese. The first questionnaire examined the respondents' prior experiences with online dictionaries and their perceptions of using such software. Initial data showed that most participants (89.1%) were already familiar with online dictionaries, and 94.8% of them perceived online dictionaries as useful or very useful for their studies. However, 51% of the participants had a neutral or negative opinion towards them. The study suggested that younger participants may be more familiar and comfortable with using online tools, while older participants may prefer traditional printed dictionaries.

The second questionnaire was administered after participants had used the Ġabra online dictionary. The distribution of responses was different, with more than half of the respondents having a neutral opinion or not finding the online dictionary useful. Participants who found Ġabra useful highlighted its effectiveness in finding unfamiliar words, understanding the Maltese language, and getting a clear comprehension of words, spelling, and pronunciation. For instance, one participant said:

I think Ġabra is very useful for learning Maltese, especially the grammar rules and the examples. It helps me to understand how the language works and how to use it correctly. I also like that it has different levels of difficulty, so I can choose the one that suits me best.

(Participant 12)

Those who had a neutral opinion mostly preferred not to use it, used other dictionaries such as Google Translate or were unaware of it.

Participants who found it unreliable cited poor or incorrect translations. One participant expressed their dissatisfaction as follows:

I did not find Ġabra very useful for learning Maltese. I think it is too complicated and confusing. Sometimes it gives me too much information, and sometimes it does not give me enough. I prefer to use other sources, such as books, websites, or teachers.

(Participant 21)

One participant also mentioned that poor internet connectivity reduced its availability.

I was not able to use Ġabra online dictionary as much as I wanted, because the internet connection in my area was very poor. Sometimes the dictionary would not load at all, or it would take too long to show the results. I think this affected my learning progress and motivation.

(Participant 34)

The reasons for the varied distribution were supplemented with the option for participants to explain their choices. Positive PU generated responses such as "Ġabra offers a good alternative where a normal dictionary would not help" and "useful for unfamiliar words, spelling, and pronunciation". On the other hand, negative PU mostly centred around "poor or unreliable translation".

One participant stated, "It is very hard to learn a new language without a quick reference to a language dictionary because one needs to be constantly reminded over and over of the meaning of words to be able to remember them eventually." This highlights the value that online dictionaries can offer in language learning by providing a quick and easy reference for word meanings. Another participant claimed, "It helps me with verb conjugations, pronunciation with sound (Maltese hearing)." Although the Ġabra online dictionary may not currently have sound features (Żammit, 2022), the participant mentioned that the dictionary helped them with pronunciation, which implies that they found the information provided by the dictionary useful for improving their ability to speak words correctly.

While some participants found Ġabra useful for their studies during the course, others did not find it as helpful due to issues with translation quality or availability. Negative PU mostly converged around "poor or unreliable translation". This suggests that some participants may have encountered issues with the quality of the translations provided by Ġabra. However, one respondent also mentioned that "poor internet connectivity", reduced the availability of Ġabra. This highlights the importance of having a reliable internet connection for accessing online resources such as Ġabra. Figure 7 illustrates the comparison of PU of the Ġabra online dictionary before and after the research exercise. In general, the study suggests that while Ġabra can be a useful tool in Maltese language learning, its effectiveness may vary according to factors such as translation quality and internet connectivity.

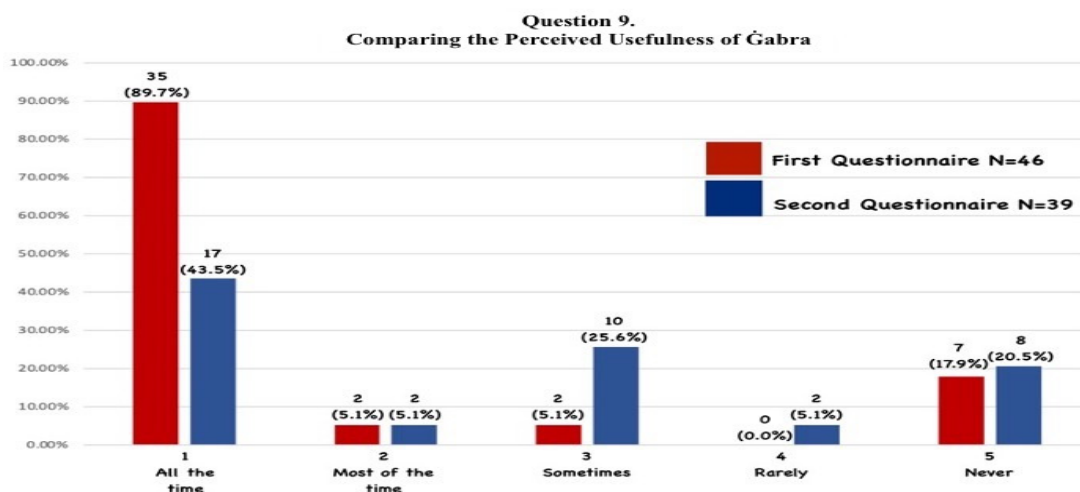


Figure 7. Comparing Perceived Usefulness of Ġabra

5.3 Evaluating User Trust and Perceived Usefulness of the Ġabra

The researchers investigated the trustworthiness and PU of the rule-based enabled dictionary, Ġabra, in comparison to a conventional dictionary. The participants were asked to fill out two questionnaires to understand their initial impression and how their experience with the system affected their perception. In the first questionnaire, 87% of the respondents expressed their trust in the rule-based enabled dictionary. Moreover, all participants agreed that Ġabra was useful for learning Maltese. As shown in the diagram below and the context of PU, the majority of respondents viewed digitally-mediated technologies, such as Ġabra, as more beneficial than conventional ones. On the other hand, 6 (13%) had some reservations concerning its use. This could be related to the participants' age and their PeoU and PU towards computers.

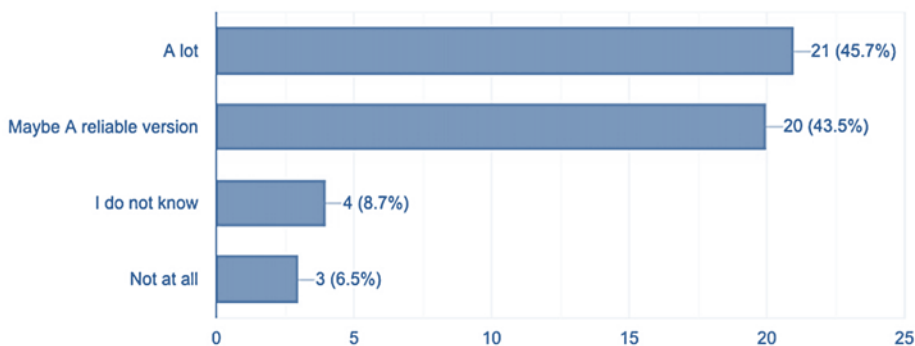


Figure 8. Questionnaire 1. The Usefulness of a rule-based powered dictionary to learn Maltese

However, Participant 32 emphasized a preference for the physical experience of using a traditional dictionary. His comment provides a counterpoint to the positive responses and highlights the importance of personal preference in language learning tools.

While Ġabra may be technologically advanced, call me “old school” but I still prefer the tactile experience and comprehensive nature of a traditional paper dictionary when learning Maltese.

Participant 32

Furthermore, according to the preceding diagram, not all respondents believed that a rule-based enabled lexicon can substitute a conventional dictionary. However, all 46 (100%) participants agreed on the usefulness of a rule-based enabled lexicon for learning Maltese.

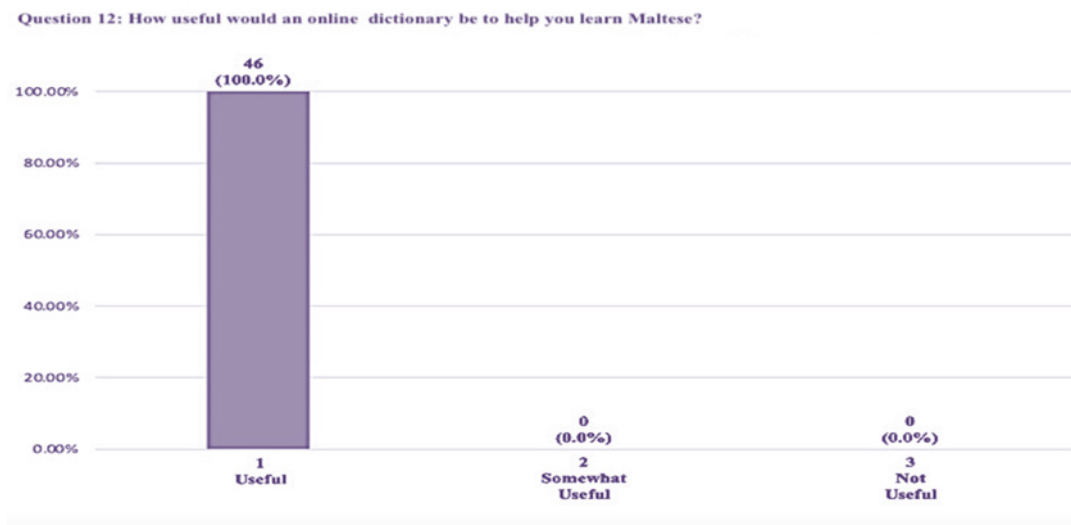


Figure 9. Questionnaire 2. Trust and Usefulness

The trustworthiness of the respondents concerning the rule-based system-enabled lexicon was again assessed in the second questionnaire. Comparing the outcomes between the first and second interviews showed different distributions. The experience gained from use influenced the participants’ perceptual change.

Questionnaires 1 and 2: Would you place trust in an online dictionary to give you suggestions and help in Maltese?

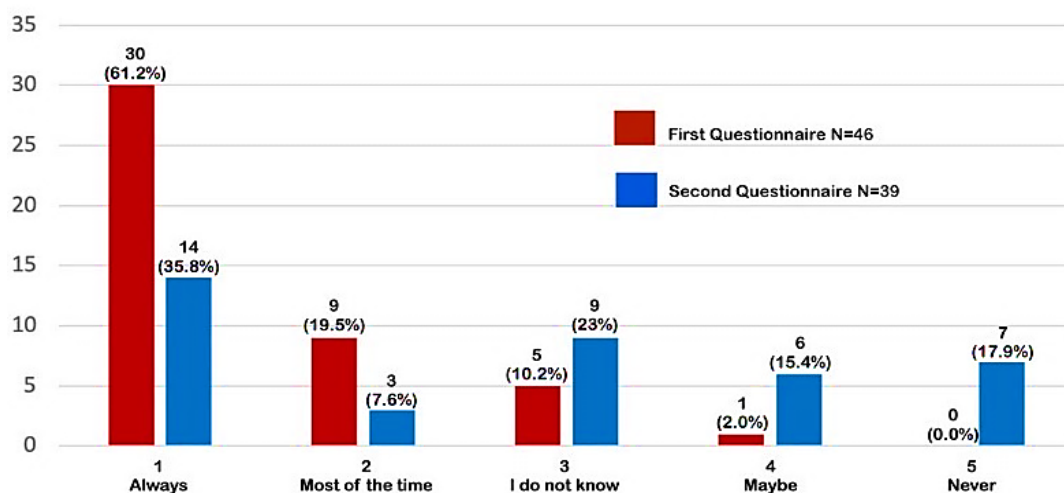


Figure 10. Comparing trustability to the Lexicon before and after use

As shown in Figure 10, the responses in the first questionnaire (red) were mostly positive. In the second questionnaire (blue), the outcome values were more spread out. This can be interpreted as a characteristic of a more detailed and granular output, reminiscent of insightful experiences that the volunteers may have gained about and through the use of the platform. For the researchers, this expressed a sense of maturing and insightful gain from constantly interacting with the technology in question.

Insights gained from interacting with the rule-based platform allowed for a more detailed articulation of interpretation and justification towards trusting the inherent rule-based system employed within the platform. In this case, a positive PU focused on the “reliability of the platform” in terms of its design, and more importantly, its practicality to “easily provide unknown words,” “the way it translates and helps you learn words,” and “its speed to provide what you are looking for.” Other positive inclinations arose from the fact that users were already familiar with other platforms such as Google Translate, and thus, the transition was easy to make: “I use Google Translate, so why not?”

According to the participants’ responses, it appears that most of them are willing to use a rule-based dictionary like Ġabra to learn Maltese, although some are sceptical or have not used it before. Participants commonly cited reasons for trusting an online dictionary such as its ability to provide quick and accurate suggestions, its convenience and availability online, and its potential to improve their understanding and usage of the Maltese language. One participant specifically mentioned the importance of having the right word to use, suggesting that an online dictionary like Ġabra could be helpful in this regard. Another participant noted that they would need more information about Ġabra before deciding whether to trust it.

Two noteworthy comments were obtained from participant 10:

It would be very useful to have an online dictionary, but I cannot say I would trust it 100%. Of course, languages are complicated, and when an AI feeds on wrong training data such as the use of slang or misspelt words from the internet and social media, the output would mirror the same mistakes.

Participant 10

These highlight the potential limitations of a rule-based dictionary and the importance of ensuring that it is trained on accurate and reliable data. As Participant 25 pointed out, “I found the rule-based system in Ġabra to be too rigid for the fluidity of language learning. It didn’t accommodate the nuances and exceptions that often come with mastering a new language.”

Participant 25’s comment brings up a valid point about the limitations of a rule-based system in capturing the fluidity and exceptions in language learning. It underscores the need for the system to be flexible and adaptable to effectively aid in language learning.

Incidentally, Participant 10 was one of the participants who considered Ġabra as an AI-enabled lexicon. The response, "Faster than human," from another participant, emphasizes one of the key advantages of using a rule-based dictionary like Ġabra, namely its speed and efficiency in providing suggestions and assistance for learning Maltese. On the other hand, some negative replies were directed towards choosing not to use the program, with respondents stating reasons such as "Because I do not believe in it" or simply because they did not know of it, either because it was not used in the course they attended or because they chose not to use it.

Concerning the degree of cognitive alignment between "the before" and "the after" of using the platform, the data from the first questionnaire showed that trust towards the rule-based system was reliant more on belief. On the other hand, the data from the second questionnaire showed that PU relied more on conviction and certainty after use. While the degrees of PU were more dispersed than the answers from the first questionnaire, the positive PU was expressed as the certainty of reliability through use, while less positive or negative PU arose from a lack of interaction with the platform.

Trust towards the rule-based system was further interpreted by seeing how much users considered that a rule-based enabled lexicon could substitute a traditional/normal paper dictionary. Comparison was made again between the first and second questionnaires (see Figure 11). Figure 11 shows the outcomes of the same questions posed before and after. The responses were quite varied and portrayed a significant cognitive misalignment that can be interpreted as a considerable shift in perceptions. In the first questionnaire, the majority of respondents (88%) were either positive or conditionally positive. However, as seen in the second questionnaire, only 26.9% were favourable.

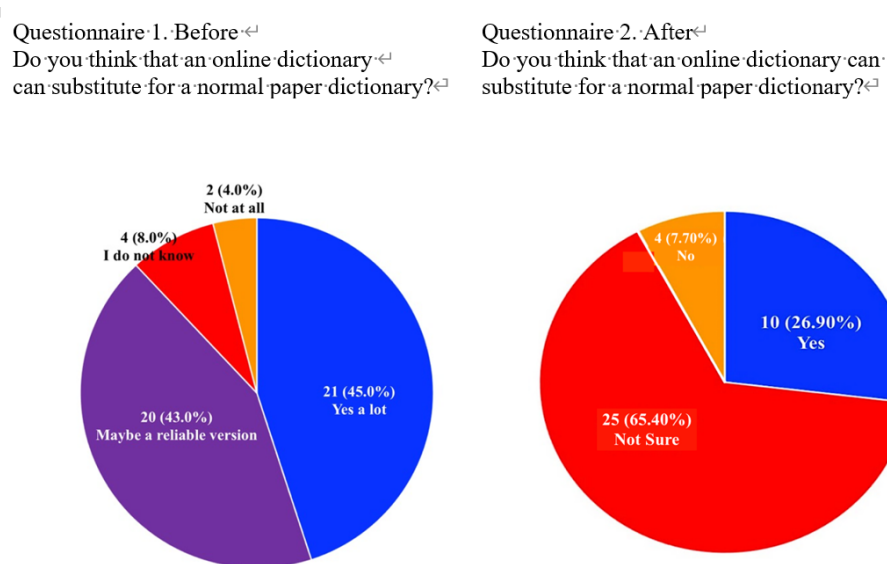


Figure 11. Using a rule-based powered dictionary versus a paper dictionary: Before and After

The affirmative responses that reflected a positive PU referred to the rule-based platform with adjectives such as "convenient," "precise," "accurate and fast," and "advanced." Statements that pertained to the "No" were characterized by the fact that there were instances where provided meanings were erroneous, or that users still preferred to use a conventional paper dictionary.

Some participants had not used or heard of Ġabra before, and therefore could not provide a clear answer or opinion. Others highlighted the convenience and speed of using an online dictionary like Ġabra, suggesting that it could be a useful supplement to a traditional dictionary. However, some participants expressed scepticism about the reliability of a rule-based dictionary and preferred traditional paper dictionaries.

One participant noted that a normal dictionary has been written and proofread for correctness, while a rule-based dictionary may not always provide accurate information. On the other hand, another participant expressed a preference for online platforms and electronics over traditional media, suggesting that a rule-based dictionary may be more suitable for their needs. In general, the responses indicated that there is no clear consensus on whether a rule-based dictionary can fully substitute a normal dictionary, and that individual preferences and needs may vary. Those who were "Not Sure" admitted that they had never used Ġabra and that they were not made aware of it during their course.

One notable comment was that:

It won't replace a normal dictionary because a normal dictionary has been written and proofread for correctness, but it can be a good supplement to a normal dictionary as it can suggest words/phrases that are normally used today rather than formal words/phrases that are never used in normal conversations.

Participant 12

Specifically, this comment expresses how gained insights enabled users to update their attitudes towards the rule-based system. This comment acknowledges the limitations and accuracy of Ġabra when compared to a traditional dictionary. In general, respondents admitted that Ġabra contains too many errors which are not present in traditional paper dictionaries and that some educators and students are now correcting its flaws. On another note, they also admitted that it can still be useful as a supplement due to the ease with which it can provide commonly used words and phrases.

Comments of the likes of: "As with Google, sometimes Ġabra doesn't give you the right words and their meanings," and, "An online platform will help a lot since we are all using electronics," suggest that the rule-based Ġabra dictionary may have certain advantages over a traditional dictionary. For example, the first quotation suggests that the Ġabra dictionary may be as accurate in providing the right words and their meanings as Google. The second quotation highlights the convenience of an online platform which, given the widespread use of electronic devices is particularly relevant. Consequently, these quotations suggest that the rule based-enabled Ġabra dictionary may have both advantages and limitations when compared to a conventional dictionary. Accordingly, its usefulness depends on the subjective needs and preferences of the user.

As previously mentioned, the second questionnaire was similar but not identical to the first one. While both questionnaires were directed towards understanding the participants' perceptions of the rule-based enabled lexicon, the second questionnaire went a step further to uncover the reasons behind any changes in attitudes. After asking participants how much they believed the Ġabra lexicon could replace a traditional dictionary, the second questionnaire assessed the PEOU of the lexicon by asking participants to rate the difficulty of using it on a Likert Scale, with '1' indicating 'most difficult' and '5' indicating 'least difficult'.

Question 15: How difficult is it to use Ġabra?

39 responses

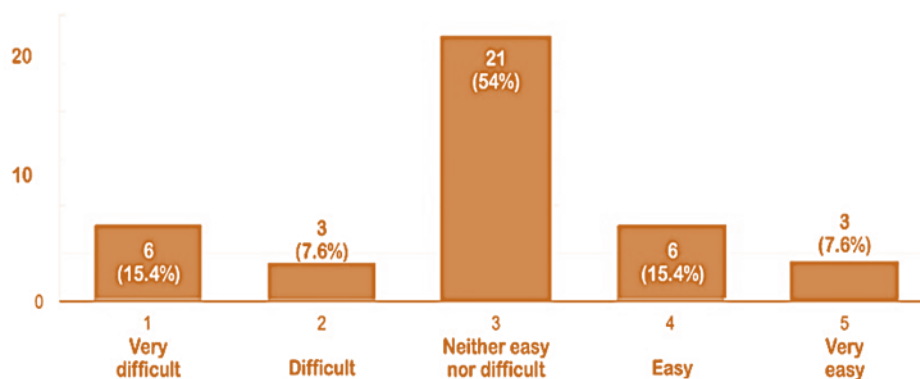


Figure 12. Perceived Ease of Use of Ġabra

Figure 12 shows the results of the PEOU assessment, with participants' responses distributed evenly around a neutral or balanced answer. This indicates that an equal number of participants found the online lexicon either relatively difficult or easy to use. To determine whether there were any changes in attitudes towards Ġabra, the study also evaluated the participants' behavioural intentions by asking them about their recommendations for the future use of Ġabra for learning Maltese.

Question 16: How much do you recommend using an online dictionary like Ġabra to learn a language?

39 responses

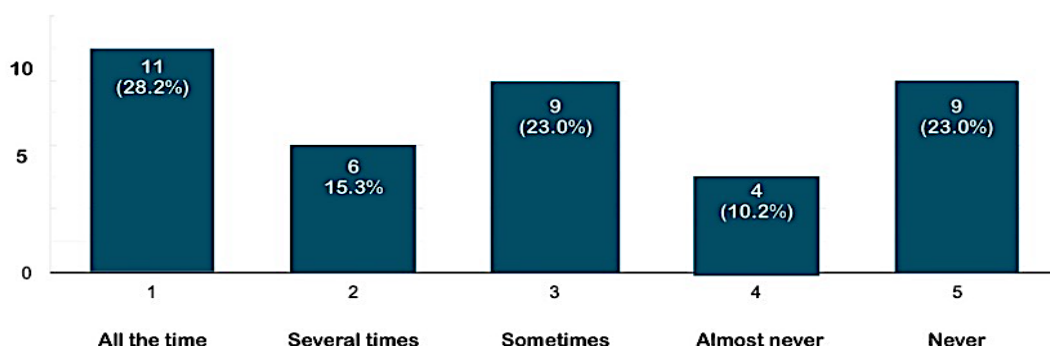


Figure 13. Perceived Usefulness of Ġabra

Figure 13 portrays the participants' varied responses towards the usefulness of Ġabra for learning Maltese. Some participants found Ġabra to have a "simple" and "straightforward interface" that was "conveniently available anywhere and anytime," making it a "very handy" and "good supplement to learn with." However, others who gave neutral, stated that they did not use Ġabra because they were unaware of it or else gave negative replies as it was not recommended by their respective tutors. Additionally, two participants preferred paper dictionaries over online ones. Others found Ġabra's translations inaccurate and at times difficult to use.

Despite these varying opinions, a common theme that emerged was the convenience of using an online dictionary like Ġabra for learning Maltese. Still, some participants expressed concerns about the accuracy of the translations and suggested that more information is needed before fully endorsing Ġabra as a Maltese language learning tool. One participant recommended using Ġabra as a supplement to traditional dictionaries rather than as a replacement. A quotation that stands out is "it should be helpful" indicating a positive sentiment towards using Ġabra for language learning. This suggests that participants are receptive to new language learning tools and technologies to aid in language learning, and with further improvements, Ġabra may become a more widely accepted and recommended Maltese language learning resource. When the Behavioural Intention of future use was tested for a 'Yes', 'Maybe' or 'No', the distribution in Figure 14 was obtained.

Question 18: Do you intend to keep on using Ġabra to learn more about Maltese?

39 responses

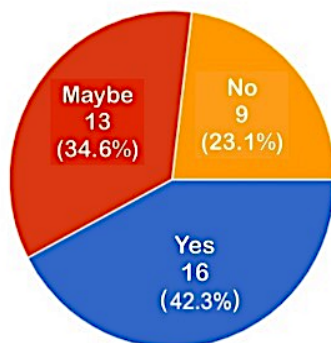


Figure 14. Behavioural Intention for use

As shown in Figure 14, the participants' willingness to use Ġabra as a Maltese language learning tool varied. Some participants found it helpful, user-friendly, and a convenient way to build vocabulary. This was elaborated with phrases such as: "very interesting to use", "convenient" and "easier, faster and/or more straightforward" than a conventional paper dictionary. Others were not familiar with it or had concerns about its accuracy. Some participants suggested that Ġabra could serve as a useful supplement to traditional dictionaries, particularly in cases where it is difficult to find accurate information using other resources.

Participant 7 expressed "It helps me a lot." This quotation suggests that the participant has found Ġabra to be useful in their language learning process and in likeness has had positive experiences with the Ġabra online dictionary. This positive sentiment may therefore encourage others to continue using the tool to further their understanding of the Maltese language.

There are some words and phrases that are difficult to find information on, whether they are being translated correctly or used correctly. An additional reference such as this online dictionary can be very helpful.

Participant 6

Participant 6 highlighted the potential limitations of traditional dictionaries. She suggested that Ġabra may serve as a helpful supplement in cases where it is difficult to find accurate information using other resources. Such comments may imply that Ġabra can be a valuable tool for language learners seeking additional guidance and information beyond what is available in more traditional language resources.

All 13 participants who selected 'Maybe' claimed that they were unaware of Ġabra. The same was true for three participants who replied with a resounding "No". On the other hand, 6 out of 9 participants who indicated that they did not intend to use Ġabra, again highlighted how: "at times it was inaccurate in its translation".

Furthermore, the responses suggest that the decision to continue using Ġabra depends on individual preferences and needs, as well as the tool's effectiveness in helping users learn Maltese. Some participants may prefer using traditional paper dictionaries, while others may find online dictionaries like Ġabra to be more convenient and easier to use. In general, the results indicate that the participants are open to using new technologies to aid in language learning, but more information and experience may be needed before fully endorsing it.

6. Discussion

The study's results revealed varying perceptions of computers among participants, which seemed to influence their attitudes and behaviours towards the Ġabra rule-based platform. Most participants held a positive perception of computers, reporting a high level of Perceived Ease of Use (PEoU) and Perceived Usefulness (PU). They viewed computers as essential tools for various purposes, including work, communication, and entertainment. They also demonstrated a high level of familiarity and comfort with computer technology, adapting their use of different devices to their specific needs and preferences while learning Maltese. These findings align with previous studies that found positive relationships between PEoU, PU, and user satisfaction with computer technology (Davis, 1989; Venkatesh et al., 2003).

Interestingly, positive PU was often linked to the reliability and practicality of the Ġabra platform, such as its ability to quickly provide unknown words and its efficiency in translating and aiding in word learning. Familiarity with similar platforms like Google Translate also seemed to facilitate a positive transition to using Ġabra. However, a small proportion of participants held a negative or neutral perception of computers, reporting a low level of PEoU and PU. They experienced frequent problems with computers, finding them difficult, complicated, or unreliable. They did not value computers as important or beneficial for their lives and preferred to use other sources or methods instead. These findings are consistent with previous studies that found negative relationships between PEoU, PU, and user resistance or avoidance of computer technology (Bagozzi, 2007).

These varying perceptions of computers may have influenced the participants' perceptions of the Ġabra platform, accessed through computers. Participants with a positive perception of computers were more likely to perceive the platform as easy to use and useful for learning Maltese, engaging more actively and frequently with the platform. Conversely, participants with a negative or neutral perception of computers were less likely to perceive the platform as easy to use and useful, engaging less actively and frequently. These hypotheses align with the Technology Acceptance Model (TAM), which proposes that PEoU and PU are the main determinants of user acceptance and usage of technology (Davis, et al., 1989).

The study's findings have several implications for the design and development of online dictionaries for language learning. Firstly, it's important to consider the needs and preferences of the target users, providing them with options and flexibility to customize their learning experience. For instance, the Ġabra online dictionary could offer different levels of difficulty and modes of presentation and interaction to suit the learners' goals and abilities. Furthermore, ensuring the quality and reliability of the information and translations provided by the dictionary is essential, and these should be updated regularly to reflect changes and developments in the language. Lastly, addressing technical and logistical challenges that may affect the dictionary's usability and accessibility, such as internet connectivity, compatibility, and security, is necessary. Improving these aspects could enhance the Perceived Usefulness (PU) and attractiveness of the Ġabra online dictionary for Maltese language learners.

Despite the generally positive responses, some scepticism and lack of use were observed. This underscores the importance of providing comprehensive information about Ġabra and addressing potential concerns to foster user trust and acceptance. While Ġabra was perceived as a useful tool for learning Maltese, the study emphasizes the significance of considering user experience and personal preferences. Providing adequate information is crucial to foster trust and acceptance of such rule-based systems. Future research could delve deeper into these aspects to enhance the design and implementation of similar platforms for Maltese language learning. This could potentially lead to more effective and user-friendly language learning tools in the future.

7. Limitations of the Study and Recommendations

The study presented limitations related to the sample size and the method of collecting data. The fact that the questionnaires were not given directly to the target audience is a significant limitation, as it is difficult to establish whether all the participants were reached, and who replied to the questionnaires. Additionally, there was no guarantee that the respondents had sufficient exposure to the Ġabra platform before taking part in the study.

To address these limitations, future research should consider conducting studies with larger sample sizes and longer exposure periods to the Ġabra platform. In the context where users' changing perceptions were intentionally compared, it is important to ensure that most, if not all, of the same cohort of participants is involved, to enable more coherent comparisons. Furthermore, future researchers should take into account other factors that may influence the acceptance or rejection of a rule-based enabled online dictionary, such as social, economic, political, and cultural factors. This will provide a more comprehensive understanding of the context in which such online dictionaries are used, and how they can be improved to better meet the needs of adult learners of Maltese as a foreign language.

The study did present valuable insights into the adoption and adaptation patterns of the Ġabra platform that ultimately would facilitate the design of more personalised learning approaches. However, there is scope for more extensive research to determine users' expectations towards the effectiveness of the platform in supporting Maltese language learning. Specifically, the recommendations provided can guide future researchers in designing studies that address the limitations of this study and provide a more comprehensive understanding of the role of Ġabra rule-based enabled lexicon in Maltese language learning.

One of the main recommendations is to use more qualitative methods, such as interviews or focus groups, to gather more in-depth data from the participants. This will allow for a more thorough exploration of their experiences, opinions, preferences, and challenges with the Ġabra platform, as well as the factors that influence their acceptance or rejection of the rule-based enabled online dictionary. By using more qualitative methods, future researchers can gain a richer and deeper understanding of the users' perspectives and needs, and thus design more effective and user-friendly online dictionaries for Maltese language learning.

8. Conclusion

Ġabra cannot be described as an intelligent AI-enabled technology. However, in the context of the Volatile, Uncertain, Complex and Ambiguous (VUCA) times that Caena and Redecker (2019) employ to express the uncertainty underlying the rapid deployment of autonomous machines, education must accommodate and reflect new socioeconomic necessities (Aoun, 2017). In this case, traits within Education 4.0 (E4.0) which include personalised learning approaches (Hussin, 2018), move away from a one-size-fits-all model in education, empowering students with different qualities to achieve their potential. In this context, the study's focus on understanding users' evolving perceptions and experiences can inform educators on developing more personalised and effective online language learning tools that are tailored to learners' needs and preferences. By taking into account the factors that influence learners' adoption and usage of digital technologies, language educators and developers can create more engaging and effective learning environments.

Moreover, the study investigated changes in participants' preconceived attitudes towards learning with respect to conventional and electronic devices, examining the perceptions of non-native adult learners towards the use of the Ġabra online lexicon for learning Maltese. The findings reveal that initially, participants were willing to adopt Ġabra, but direct hands-on experiences made them more cautious in their idea for its employment. Adaptation was directly related to perceived and actual or realized cognitive alignments before and after using the lexicon. Therefore, the study highlights the importance of providing learners with sufficient contextualized experiences to promote positive attitudes and sustained usage of online language learning tools. By incorporating hands-on experiences and real-world applications into the learning process, educators can help learners build a deeper understanding of the language and increase their motivation to continue learning. This can lead to better learning outcomes and increased proficiency in the target language.

Consequently, the study's findings suggest that a user-centred and contextually tailored approach to technology adoption is crucial for the success of online language learning. By understanding users' perceptions and experiences, educators and developers can create more effective and engaging learning tools that meet learners' needs and promote sustained usage.

List of Abbreviations

PEoU: Perceived Ease of Use

PU: Perceived Usefulness

TAM: Technology Acceptance Model

TFR: Technological Frames of Reference

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