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A Design Methodology for a Computer-Supported Collaborative Skills Lab in Technical Translation Teaching

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Abstract

Aim/Purpose	The aim of this study is to adopt more systematically the collaborative learning dimension in the technical translation teaching at Master Degree level. In order to do so, a computer-supported skills lab approach is targeted. This approach is aimed at enhancing traditional courses on Computer-Assisted Translation (CAT) so that student competences and soft skills are enhanced.
Background	In traditional CAT courses, laboratory sessions complement theoretical lessons, thus providing students mainly with tool-oriented operational knowledge, while nowadays more intertwined competences are required by the labor market. Moreover, this sector lacks skills labs which engage students in collaborative activities mimicking professional workflows, thus not exploiting team-based learning potential effectiveness.
Methodology	In this paper, therefore, a design methodology to deploy and operate an enhanced skills lab as a remote Computer-Supported Collaborative Simulated Translation Bureau (CS2TB) is proposed and validated. The proposed methodology is based on a set of intertwined methodological frameworks that address: 1) student competences and educational requirements, 2) collaborative aspects, 3) regulatory policies as well as functional and interactional guidelines for the simulated fieldwork. The overall effectiveness of the proposed methodology has been assessed by using *pre-post* questionnaires to ascertain student feedback. The improvement in technology skills has been evaluated by collecting and examining student help requests as well as system error logs.
Contribution	The CS2TB provides a technology-enhanced simulation-based learning environment whose aim is twofold: first, enriching traditional approaches with a Com-

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puter-Supported Collaborative Learning (CSCL) experience and, second, incorporating widely adopted approaches for the translation-teaching domain as the required grounding knowledge.

Findings: Results demonstrate the effectiveness of CS2TB in improving students' competences (specifically in the IT area but also in the technical translation area), students' willingness to operate in a fieldwork-like context and cooperative learning efficacy.

Recommendations for Practitioners: The educational implications of the proposed approach concern the development of a full range of competences and soft skills for students in the technical translation teaching at the higher education level, ranging from language and translation proficiency to the usage of IT platforms as well as personal and interpersonal interactional soft skills.

Recommendations for Researchers: This study offers a wide overview of all the aspects entailed by the design, implementation, management, and evaluation of a skills lab for technical translation teaching. Researchers may benefit from the rigorous modelling approach as well as from the adopted assessment techniques. Moreover, the study stresses the pivotal role of a tight collaboration between language/translation teaching and computer engineering.

Impact on Society: Higher education institutions that already have courses on computer-assisted translation may benefit from the proposed CS2TB approach, which allows them to design new thematic activities leveraging team-based learning, collaborative learning, and fieldwork-situated simulation. Moreover, the presented broad range of assessment approaches can be used to measure the impact of CS2TB on learning outcomes of the involved students.

Future Research: Future research activities will be dedicated to examining the impact of a different set of enabling IT platforms on the collaborative learning perspective, to evaluate alternative scaffolding approaches (e.g., chatbots or augmented reality), and to increase simulation fidelity further, so that even more student competences can be fostered.

Keywords: collaborative online learning, team-based learning, computer-assisted translation, higher education, skills lab, simulation-based education

INTRODUCTION

In the last two decades, technical-translation teaching in the European Masters of Arts (MA) curricula has been considerably impacted by Information Technology (IT) (C. Zhang & Hui, 2015). Computer-Assisted Translation (CAT) and Machine Translation (MT) have been incorporated into traditional didactic programs because technology-aware translators are needed by the professional market and technology-assisted translation allows improving translator's productivity and effectiveness significantly (Krüger, 2016; Pym, 2013; Rothwell & Svoboda, 2019). Courses on CAT software tools are usually provided as laboratory activities where students improve their computer literacy. However, this configuration is still tailored to individual learning and operational knowledge (Gaspari et al., 2015), making it poorly suited to train a modern translator (Malenova, 2019) and to create collaborative learning and cooperative work contexts.

Highly-selective, EU-promoted competence frameworks (Göpferich & Jääskeläinen, 2009; Toudic & Krause, 2017) have failed so far to improve student competences and soft skills on a continent-wide scale. Similarly, skills labs engaging students in Simulated Translation Bureaus (STBs), where they can experience, either independently or supervised by teachers, the professional workflow and roles available in a real translation company (Buysschaert et al., 2017), only provides a partial solution to overcoming the limitations, as the STBs do not share modelling guidelines. Another issue is the absence of provision for Computer-Supported Collaborative Learning (CSCL), even if a student's self-assessment of inter-personal skills has started to emerge (Fernandez-Parra et al., 2018).

In order to fill these methodological gaps, a design proposal for an enhanced STB is introduced in this paper. The concept has been defined as an online *Computer-Supported Collaborative Simulated Translation Bureau* (henceforth, CS2TB), to be applied to any MA curricula in translation teaching. The core aim is to engage students in a simulated working environment that mimics the working processes of a real translation bureau through experiential learning with an adequate level of simulation fidelity and acts as a skills lab where simulated jobs are assigned and managed depending on students' roles.

The paper is organized as follows: first, a literature review is presented, with a specific focus on the educational landscape of translation teaching as well as on collaborative learning aspects and related assessment strategies. Then, the design methodology and the theoretical base required to contextualize the CS2TB will be proposed. A detailed description of the use in terms of participant typologies, data collection approaches and enabling IT tools will be provided. Subsequently, assessment results will be thoroughly examined and the implications for educators and researchers will be discussed. Finally, conclusions and future research opportunities will be drawn.

Literature Review

The Educational Landscape: A Background Analysis on Technical Translation Teaching in M.A. Degrees

Technology is changing the approach to translation at a very fast pace (Kiraly, 2015) and professional translators rely on CAT tools for managing technical and scientific texts (Krüger, 2016; Lin, 2016) because these tools are designed to speed up translation, improve productivity and ensure consistency (Bowker, 2002). Stand-alone desktop CAT tools are provided mainly for students/freelancers, while cloud-based CAT tools that enable role-based cooperation are for businesses, thus students rarely experience cooperative work. Even if the need of technology-mediated teaching is widely agreed upon by educators (C. Zhang & Hui, 2015), a significant gap still exists between the market and universities (Ivanova, 2016). The majority of academic courses still rely on CAT teaching, sometimes leveraging online CAT platforms (Bilić, 2020). This allows preparing students to face the freelance scenario (Granell, 2014), while additional relevant competences (e.g., role partitioning, task management and allocation, cooperation, etc.) are not addressed (Malenova, 2019).

Therefore, *translation competence frameworks* (Göpferich & Jääskeläinen, 2009), such as the EMT model (Toudic & Krause, 2017), have been proposed to foster students' competences in: *language and culture*; *translation*; *technology*; *personal and interpersonal*; *service provisioning* (EMT Expert Group, 2009). However, only 73 (of more than 2k EU universities (uniRank, 2020)) were ranked EMT-compliant for the 2019-2024 period (European Commission, 2019) and they will have their compliance assessed again after every 5-year validity period. Nevertheless, for many universities the EMT represents a guideline to upgrade translation courses, with a specific focus on technology adequacy and collaboration (Shuttleworth, 2017; Thelen, 2016). Consequently, the EMT model is helpful for the CS2TB as it will be perceived as the common ground by translation and language teachers and, at the same time, it will allow for collaboration aspects (*personal and interpersonal* competence area) and cooperative work (*service provision* competence area), as will be discussed in the next section.

In the early 2010s, a handful of EU universities introduced STBs (Krüger & Serrano Piqueras, 2015) to involve students in teacher-supervised lab activities, that mimic real translation companies by adopting professionalizing holistic training principles, based on learning-by-doing experiences (Buysschaert et al., 2018). As of today, only a dozen STBs are active (Buysschaert et al., 2017): the scenario provides for heterogeneous educational offerings, multiple configurations, different ways to engage students and several approaches to assess pedagogical effectiveness and collaborative work/learning outcomes.

However, despite the scarcity of STBs, collaborative learning in universities is accepted as an effective approach (Flores et al., 2015), that allows students to increase cognitive abilities as well as to develop social and communication skills. The literature landscape in this sector is extremely rich, as the constant technological progress makes collaboration a pivotal aspect in any work environment, thus motivating a large stream of research whose findings date back to the early 2000s (Barron, 2000; Lipponen et al., 2004). It is largely agreed that the efficacy of collaborative learning increases by combining two complementary principles (Wang, 2009): first, clearly identifying the individual contribution of each student (i.e., *individual accountability*); second, defining the correlation between individual and group performances (i.e., *positive interdependence*). To support them, scaffolding with progressive fade out is needed (Shin et al., 2020), along with the usage of:

a) collaboration scripts indicating how to perform activities (Dillenbourg, 2002);
b) epistemic scripts favoring inquiry-based and problem-solving behaviors (Hamalainen, 2008);
c) social scripts specifying how to interact properly (Weinberger et al., 2005).

In order to improve and systematize the design and coordination of these activities, the GLAID framework (De Hei et al., 2016; Dennen & Hoadley, 2013; Janssen, 2014) was defined, as a set of 8 components:

1) *Interaction*: to pursue learning goals in terms of understanding the knowledge domain and participating in meta-cognitive activities (e.g., planning, monitoring, analyzing the collaboration), shaped as mutual help amongst peers or actual collaboration to fulfil pre-defined goals.
2) *Learning objectives and outcomes*: the set of individual/group learning goals referring to declarative/procedural knowledge about specific topics and social skills.
3) *Assessment*: performed individually and/or by group, classified as either formative (i.e., performed during the collaborative experience, they are an assessment *for* learning) or summative (i.e., performed after the collaborative experience, they are an assessment *of* learning).
4) *Task features and meaningfulness*: all the aspects describing the tasks assigned to students (i.e., typology, time sequence, duration/frequency, performance control), perceived as functional (i.e., *meaningful*) to attain learning goals.
5) *Structuring*: the way the collaborative experience is structured determines its interactional success. Structuring can be performed before (i.e., *a priori*) or during the experience. After the experience, reflection and evaluation about the structuring effectiveness must be activated in participants.
6) *Guidance*: teaching, coaching, tutoring, and mentoring activity offered to students. It requires defining the: executor who guides the students (e.g., teacher, software), teacher's role (e.g., expert, coach, facilitator, proctor, etc.), communication mode (i.e., how the executor reaches the students), duration and timing of guidance. This component allows providing instructional scaffolding to participants (Rienties et al., 2012).
7) *Group constellation*: organization of student groups, in terms of number, size, type (i.e., heterogeneous or homogeneous by one or more classification criteria) and duration.
8) *Facilities:* learning and teaching resources, including the physical/electronic space where the collaborative experience happens and its working temporal window (Chiriac & Gronstrom, 2012).

The full list of GLAID components has been adopted as one of the grounding theoretical frameworks for the proposed approach, thanks to its rigorous structure, so that it can be used as a guideline to define, implement, and operate the collaborative learning activities.

Collaborative Learning Scenarios, Simulation Fidelity and Assessment Strategies

Students would benefit significantly from the introduction of a collaborative learning dimension in the educational sector described so far. During the last decade, collaborative learning and its implications in the enhancement of soft skills and critical thinking in students, have been investigated extensively. This concept has been widely agreed upon as the *"instruction method in which students at various performance levels work together in small groups toward a common goal* [and] *are responsible for one another's learning as well as their own*" (Gokhale, 1995), and it found immediate application in STEM disciplines. It has also been adopted as a promising approach in language teaching, along with the more structured and prescriptive cooperative learning, due to its social constructivism base that helps in creating language learning communities (Oxford, 1997). In collaborative learning, the achievable outcomes range from academic to social and educational, but careful implementation strategies are required in order to build student groups appropriately (Johnson et al., 2007). By doing so, effective interaction mechanisms are triggered (Baker & Clark, 2010), so biased or unequal individual participation in group tasks is avoided (Freeman & Greenacre, 2010), and student's lack of communication skills is tackled (Pauli et al., 2008).

Early this century, the collaborative learning dimension has been progressively supported by a new and constantly increasing spectrum of enabling technologies, which allowed creating a technology-driven environment capable of enhancing learning outcomes, usually identified as the Computer-Supported Collaborative Learning (CSCL) context (Dennen & Hoadley, 2013). Consequently, a considerable amount of CSCL-based studies have been proposed in the scientific literature in recent years, ranging from lifelong learning (A. Ma, 2009) and Ph.D. courses (Ly et al., 2017) to K-12 education (Nikolaidou, 2004). Similarly, the CSCL effectiveness nowadays spans across all disciplines, from library and information science education (Liu, 2012) to STEM (Jeong et al., 2019), from marketing (Ly & Saadé , 2017) to translation (Ali, 2021).

Another aspect that promises to improve the CSCL perspective further, by making it more situation-oriented, is the simulation fidelity that the collaborative learning context is able to reach. In this research, the term *simulation* is used as the computer-enabled representation of a real-life context aimed at improving its actors' skills via experiential learning so that teamwork, problem solving, and decision-making capabilities are enhanced (Campos et al., 2020). A considerable stream of scientific literature dealing with simulation-based STEM education is available (Becker & Hermosura, 2019; Riley, 2012). For instance, healthcare and pharmacy prospective practitioners might exploit simulation-based learning to be better prepared for fieldwork, improve their knowledge and gain career-ready skills (Hattingh et al., 2018). More generally, however, several types of fidelity can be considered in order to provide users with a simulation experience having an acceptable degree of realism and making it possible to address non-STEM contexts. Therefore, fidelity can be examined depending on: the physical equipment required to enact the simulation; the environment recreated by the simulation; the functional aspects of the simulation; the tasks assigned to participants and the technical and technological authenticity of the simulated experience (Hontvedt & Øvergård, 2020). Depending on the presence of devices and equipment to be simulated, some of those fidelity levels can be omitted.

The collaborative aspects discussed so far, require a tailored assessment approach and a careful selection of suitable data types (Pine & Liboiron, 2015) to decide whether to rely on observed or reported behaviors or both (Jensen et al., 2005). Similarly, this is needed to inform participants that their activities will be examined for research purposes and that data privacy aspects are taken into consideration (Bruckman, 2014).

As for the assessment strategies, three different typologies are usually referenced in collaborative contexts (referred to as both collaborative learning and collaborative work): group assessment, individual assessment and group assessment with intra-group peer assessment (Meijer et al., 2020).

In group assessment, a pool of collaborating students is evaluated in terms of learning/work outcomes with a group grade. This approach fosters positive interdependence, since each group member depends on the other ones (Dijkstra et al., 2016) but, at the same time, a clear identification of individual contributions is problematic (Forslund Frykedal & Hammar Chiriac, 2011). Consequently, differences between group members with unequal competence levels are amplified (Forsell et al., 2020). Moreover, the student behavior is much more oriented towards achieving a given degree of performance or towards accomplishing a specific set of tasks in time instead of aiming at a true collaborative learning outcome (Pitt, 2000).

On the contrary, when individual assessments are provided by supervisors to each student, the participant's abilities are identified more clearly, under the assumption that even individual abilities are affected by collaborative actions and knowledge exchange in a CSCL scenario (Strijbos, 2016). Two risks may arise: fostering rivalry (as in traditional individual scoring) and reducing the real extent of the collaboration (Meijer et al., 2020).

In the third approach (Strijbos, 2016), groups are assessed by intra-group peers or by peers from another group (i.e., inter-group peers). The intra-group peer assessment is the most widely adopted technique, especially in cooperative work contexts, as it provides insights from within each group, fosters participation and offers a focus "*on the collaborative process rather than the collaborative product*" (Forsell et al., 2020). However, internal group dynamics (e.g., pre-existing friendships/enmities, unexpected conflicts, personal interests) could influence this assessment negatively and, therefore, it should be complemented by traditional group assessment (Meijer et al., 2020).

The CSCL perspective and the requirements in terms of simulation fidelity and assessment strategies entail the dimension of collaborative work. Translation students should benefit not only from traditional didactics, but also from collaborative work experiences focused on professional IT solutions and driven by the labor market, which nowadays requires a strong commitment to cooperation (due to the coexistence of several roles such as translators, reviewers, proofreaders, project managers, etc.).

When collaborative work is involved, a frequently debated question is whether individual assessment is preferable to group assessment (Bocconi & Trentin, 2012; Hakkarainen, 2009): a mainstream approach suggests relying on all those assessment metrics involving the core aspects of collaboration, such as teamwork and interactions (Muukkonen et al., 2020). As a direct consequence, the collaborative work performed by students requires group assessment (Cumming et al., 2015) but individual assessment is also needed to focus on the capabilities of each individual to perform collaborative tasks appropriately (Kember & Leung, 2009; Spencer & Spencer, 2008).

Research Questions

The elements sketched so far highlight how important it is to address student competences, educational needs and collaborative learning requirements in this sector. Appropriate assessment strategies are required when novel educational approaches are introduced, in order to ascertain their effectiveness and feasibility.

This paper will address both the design and the evaluation perspectives (Wainer & Barsottini, 2007), thus providing the readers with an end-to-end analysis. Therefore, the following research questions (RQs) are considered:

> **RQ1:** What is the intended context of use and what are the user groups of a CS2TB?
>
> **RQ2:** What are the theoretical foundations and the users' common knowledge base upon which a CS2TB can be built?
>
> **RQ3:** How can the effectiveness of the CS2TB model be evaluated?

METHODOLOGY

This article proposes a novel conceptual multi-standard framework to offer a simulated learning and working environment (i.e., a simulated translation bureau) for future professional translators who will be required to cooperate and to interact. The framework is named CS2TB and it is based on the simulation fidelity concept proposed in (Hontvedt & Øvergård, 2020). Four, intertwined simulation fidelity levels are addressed: *contextual* (closeness to a real translation bureau), *technological* (availability of enabling IT platforms), *functional* (lists of tasks for involved users) and *interactional* (inter-user engagement patterns).

This section will consider the different typologies of participants to be involved. Then, assessment strategies and data collection activities will be explained. After that, it will be proposed how to compose a suitable modelling framework so that the identified user groups can share common ground to trigger profitable collaborative learning experiences and to foster context-awareness (Clark, 1996), by focusing on shared educational requirements elicited from teachers, and student competences. Finally, the identified set of enabling IT tools will be discussed.

PARTICIPANTS AND DATA

The CS2TB was implemented as a curricular project activity for the MA in Scientific and Technical Translation at the University of Salento (Lecce, Italy). The project lasted 8 months (during two academic semesters) and ended in mid-2020. The following user groups were recruited in order to answer RQ1.

1) *Language/translation teachers*: they represent the majority of teachers (up to 90%) in this context and usually they are the teaching figures the students are more acquainted with. In their courses, computer applications are mainly used as supportive assets for specific tasks only (e.g., homework assignment/collection, terminology management, online dictionaries, etc.).
2) *IT teachers*: usually they are much fewer (up to 10%) and their courses have a secondary role. Many of them come from computer engineering/science and their different expertise may create interaction difficulties with language/translation teachers.
3) *MA students*: students with a BA in translation, a medium-to-high level of knowledge in language and translation, a low-to-medium level of expertise on IT topics.
4) *MA graduated*: students with a recent MA in technical translation, willing to improve their knowledge about the labor market and its mechanisms (Ph.D. students were not considered in this study as a useful reference group, since often they are less interested in professional training).

Starting from these user groups, the bureau involved 18 first-year students (as translators), 14 second-year students (12 as reviewers and 2 as Project Managers), 1 graduated student (as PM) and 4 teachers (1 as platform administrator, 3 as fictional clients or language/translation supervisors). Teachers and students were trained on the use of the selected technological enablers and on the adopted operational procedures during dedicated, preliminary webinars. According to the scaffolding principles, between the webinar phase and the initial operational phase, teacher's support was progressively faded out and transferred to the students (van de Pol et al., 2010).

Students were organized in translation teams (TTs). Each TT managed a single project at a time and their composition was dynamic so that each student could participate in different teams depending on the specific project. Traditional STBs enroll students who attend the same class in the same year and role changing is not always an option. In CS2TB students were able to experience the dynamics of team working with rotations, different peers, and different supervisors. This increases the assessment quality and improves the interactional fidelity. This also makes it more difficult to identify a suitable control group exhibiting a similar dynamicity in role changing and an equivalent breakdown in terms of the participants' expertise. In addition, the large majority (79%) of eligible students from the curricular compulsory courses of CAT laboratory, have enrolled as volunteers in CS2TB, thus making the set of non-enrolled students not as representative as it might be for a reliable control group. For these reasons, the assessment procedures presented in the forthcoming sections do not refer to the traditional, control-group-grounded technique and rather focus on different assessment approaches.

The CS2TB operated in the English (UK) - Italian language pair. Since involved students were trained in health-related technical translation during their curricular courses, freely accessible HTML texts from official UK Websites (e.g., NHS https://www.nhs.uk, GOV.UK https://www.gov.uk/ , etc.) dealing with topics on nutrition, general healthcare, and COVID-19 were provided as source documents.

Due to the absence of actual clients, students were rewarded with academic credits directly proportional to the amount of their work. Specific conversion tables depending on role, language pair, number of translated/reviewed words and number of managed projects were co-created by the teachers during the training webinars and then shared with students.

Assessment and Data-Collection

The complexity of the CS2TB scenario requires a hybrid assessment approach. Both quantitative (i.e., involving numerical and/or statistical comparisons) and qualitative (i.e., aimed at explaining findings) methods were used (Wallace et al., 2017). The quantitative analysis exploited closed-ended, Likert-based questions (Vagias, 2006) administered via pre/post online questionnaires to all the participants, and there was a 100% response rate. The qualitative analysis was based on the interpretation of observational data such as system logs, students support requests and evaluations from teachers. All the involved user groups were informed in advance that their contributions would be completely anonymized before their usage in research activities.

The assessment strategies provide an answer to RQ3 and refer to the observed and reported behavior of the participants. Both formative (before project deployment) and summative (after the deployment) evaluations were performed. *Summative individual Self-Assessment* (*SSA*) was employed at first. It allowed the researchers to evaluate how students perceived their acquaintance of targeted EMT competences, via online pre-post questionnaires. Since a simulated working environment was considered, this assessment type was preferred to summative individual assessment from teachers as it made students feel more responsible and not simply evaluated by teachers as in traditional courses. Second, IT/CAT teachers provided students with *Formative Individual Assessment* (*FIA*) on technical competences. Third, *Summative Intra-Group Peer Assessment* (*SIGPA*) was activated with a final survey evaluating collaboration effectiveness in student groups. Finally, language/translation teachers evaluated CS2TB's effectiveness and cooperation amongst students by considering the average service-completion delay over client-requested deadlines and the translation quality. In this way, a multi-faceted assessment is achievable instead of traditional pre-/post-tests tuned on predefined learning objectives.

Table 1 summarizes the adopted assessment strategies, by detailing user groups and corresponding roles, data collection approaches, and timing of assessment.

Table 1: Mapping between involved user groups and assessment strategies

Parameter	Summative Individual Self-Assessment (SSA)	Formative Individual Assessment (FIA)	Summative Intra-Group Peer Assessment (SIGPA)
Involved user groups (number of units)	Students (33)	Students (33) and CAT teacher (1)	Students (15)
Corresponding user roles (number of units)	- PMs (2 students, 2nd year + 1 graduated student) - Reviewers (12 students, 2nd year) - Translators (18 students, 1st year)	- PMs (2 students, 2nd year + 1 graduated student) - Reviewers (12 students, 2nd year) - Translators (18 students, 1st year) - Platform admin (1 CAT teacher)	- PMs (2 students, 2nd year + 1 graduated student) - Reviewers (12 students, 2nd year)
Data collection approach	Two Likert-based questionnaires	Teacher-performed analysis of system error logs, technical help requests, training requests	One Likert-based questionnaire
Timing of assessment	First questionnaire before starting the CS2TB (*pre*) and second questionnaire after CS2TB conclusion (*post*)	During the operational phase of the CS2TB, once per month	After the conclusion of the CS2TB

DESIGN CHOICES AND FRAMEWORK MAPPINGS

The frameworks discussed in the Literature Review section were integrated (as depicted in Figure 1), to enforce the provisioning of a realistic CS2TB.

First, all EMT (European Master's in Translation) skills have been considered for student competences and educational requirements, except those related to MT (Machine Translation), which are rarely dealt with in MA curricula and because enrolled students could rely excessively on MT for their translation tasks without actually applying their translation capabilities.

Second, all GLAID components are required in the design process to enable the collaborative learning dimension. To clarify which student competences and educational requirements are activated by the collaborative learning dimension, the EMT elements have been mapped on GLAID components. The importance of this mapping is highlighted in Figure 1: for instance, if we consider the EMT's translation competence, required when designing learning objectives, outcomes, task features, structuring, guidance, facilities, and assessment of the collaborative learning dimension. Similarly, the technology competence from EMT is employed in each GLAID component.

The EMT and the GLAID frameworks enable the researchers to answer RQ2, as they are perceived as common knowledge ground and core educational guidelines by the involved user groups, thus avoiding any misleading impression that this approach may focus more on computer-related operational topics rather than translation and language aspects.

Once that EMT and GLAID are properly mapped, an IT service modelling theory is required, since the CS2TB's core aim is to provide translation services by relying on IT solutions allowing remote collaboration. To such purpose, the ITIL v3 framework (van Bon, 2007) has been adopted and subsequently mapped on GLAID components. This framework models any IT service lifecycle, from the design stage to the deployment, as a sequence of steps leading to a continual improvement of the service itself. The framework provides a considerable number of modelling elements and a newer version (Agutter, 2019) is now available. However, due to the peculiarities of the CS2TB context, only a subset of the third version has been referenced in this research work. In Figure 1, for instance, both ITIL's design and continual improvement stages intervene in each GLAID components. In addition, when designing and operating the CS2TB, the ISO 17100:2015 (ISO, 2015) has been used to ground the planned activities of the bureau on a standardized approach, thus engaging students in a rigorously simulated context.

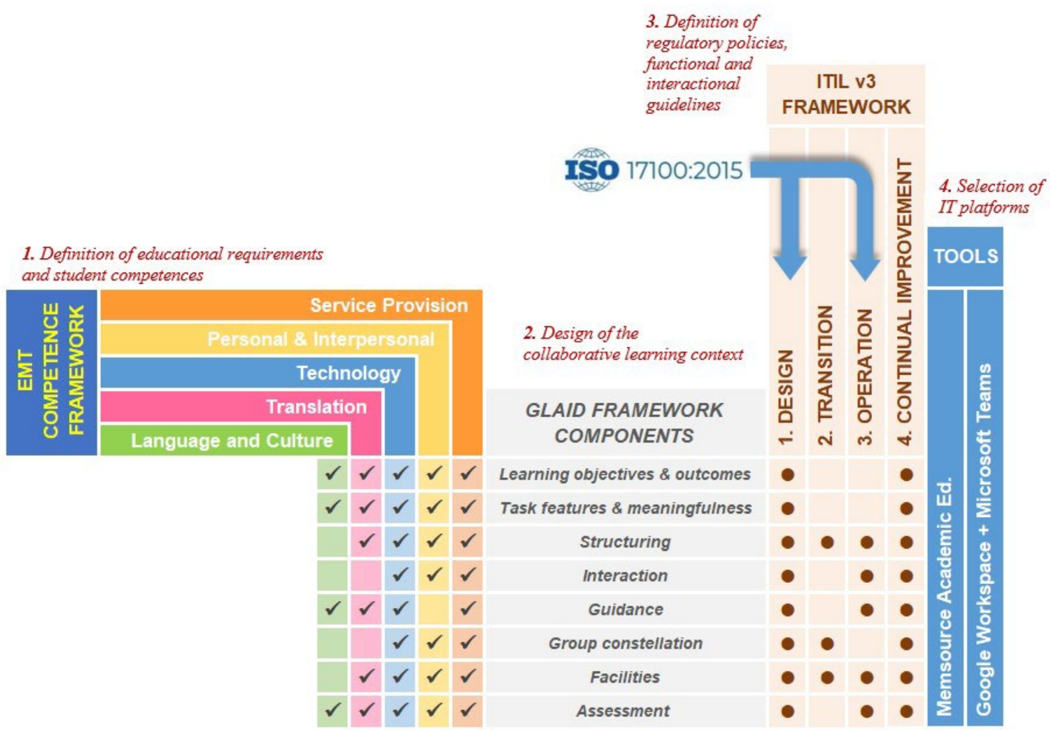


Figure 1: Design choices, full framework mapping and tool integration

Table 2 and Table 3 provide the details of how the frameworks mapped in Figure 1 have been instantiated to enable the provisioning of the CS2TB experience.

Table 2: Mapping between GLAID components, EMT competences, CS2TB modelling

GLAID framework component	Activated EMT competence(s)	CS2TB modelling choice
Structuring	All but language (focus on technical translation)	*A priori*: decided at the design phase. Students enrolled as: Project Managers (PMs), reviewers, translators. PMs directly supervise reviewers, who directly supervise translators. Each PM manages a translation project and requires a team of translators and reviewers.

GLAID framework component	Activated EMT competence(s)	CS2TB modelling choice
		Teachers participate as: supervisors, tutors, fictional clients, platform administrators. *Ongoing*: no modifications allowed during the operational phase. *Reflection and evaluation*: after the CS2TB, students and teachers attend collaborative meetings to discuss whether any structure change is needed. Accepted modification requests are applied to the next run of the CS2TB. *Duration*: two semesters, to allow students to experience an adequate number of collaborative interactions, without concentrating them in an excessively short amount of time.
Interaction	Personal and interpersonal Service provision	*Mode*: Fully online, supported by adequate IT platforms. *Mutual help*: students are peer-supported via feedback and role-based information sharing (e.g., translators to translators) about platform usage and role-specific tasks. *Actual collaboration*: students distribute tasks and responsibilities amongst themselves and according to their roles in a fair and effective way to achieve the best results. The PMs decide collaboratively who is going to manage each service request. Translators (respectively, reviewers) decide who is going to perform a given translation (respectively, review), depending on availability, effort estimation, ongoing/forthcoming exams, etc.
Group constellation	Personal and interpersonal Service provision	*Group type*: each group of students is a *Translation Team* (TT). It has a unique PM and a variable number of translators and reviewers. Such a variance increases the collaboration effectiveness (Strijbos, 2016). Each TT manages the allocated translation projects along their entire translation workflow (i.e., from client request to final provisioning of translated/revised documents). *Group size*: proportional to client requests. A small TT manages small requests more easily, while a translation request consisting of many documents should require a larger TT. Each TT must have at least 1 PM, 3 translators and 2 reviewers, in order to activate internal collaboration experiences properly. *Number of groups*: dynamic, depending on participating students and client requests. Minimum number of

GLAID framework component	Activated EMT competence(s)	CS2TB modelling choice
		TTs: no less than 3, to provide enough collaboration opportunities to participants. *Group duration*: each TT is operational until the client request is fulfilled. Each new client request determines the creation of a new TT.
Learning objectives and outcomes	All	*Individual goals*: 1) complete in a responsible way the tasks selected during cooperative interactions or assigned by direct supervisors/teachers; 2) comply with deadlines; 3) avoid complaints from direct supervisors/teachers; 4) avoid unauthorized data access and intentional damage to the platform; 5) not use MT when translating; 6) reach a satisfactory level of IT acquaintance. *Group goals*: each TT must provide the service as agreed with the client. Translation teachers evaluate translation quality and consistency as group results.
Assessment	All	*Summative self-assessment*: each student self-assesses her/his work/learning outcomes, on all EMT competences, before and after the CS2TB, via teacher-provided pre-post questionnaires. *Formative individual assessment*: the IT teacher periodically assesses how each student uses IT platforms, by checking system logs, error messages and support requests. *Summative intra-group peer assessment*: supervising students participate in a final survey to evaluate the TTs they worked with.
Task features and meaningfulness	All	*Typology*: 1) translating/reviewing documents; 2) managing translation projects; 3) interacting with clients; 5) performing assigned tasks; 6) using IT platforms; 7) assessing other students; 8) self-assessing; 9) interacting with teachers. *Meaningfulness*: 1) compliant with EMT guidelines; 2) strongly related to real use cases (i.e., clients require real translations and/or fictional clients require plausible translations); 3) stimulating for students, who are engaged in professional workflows; 4) suitable for collaborative works thanks to roles as in a real company. *Time sequence*: tasks are assigned all along the CS2TB lifecycle. *Duration and frequency*: proportional to the required effort (e.g., the longer the document to be translated, the longer its corresponding task). Task assignment frequency must not hinder students' proficiency in other

GLAID framework component	**Activated EMT competence(s)**	**CS2TB modelling choice**
		exams and must not slow their studies down. Each student should be required to perform at least a task per month. *Performance control*: as specified in the *Assessment* section.
Guidance	All but personal and interpersonal	*Executor: 1)* teachers; 2) students instructing their supervised peers. *Teacher's role*: 1. Pedagogical: train enrolling students and support them once enrolled; foster inquiry-based learning in students. 2. Social: motivate students to collaborate and define shared goals for groups. The collaboration amongst teachers exemplifies to students how groups should work. 3. Organizational: support the organization/balancing of groups; intervene when student collaboration is not effective or unfair interactions are spotted; manage/update the IT platform. *Communication mode*: dedicated online seminars/meetings; instant messaging via collaborative online platforms (as the students are already largely acquainted with them). *Duration and timing*: performed before the CS2TB, to instruct participants on roles and tasks (pre-defined number of seminars) and during the CS2TB operational phase. *Provisioning mode*: teachers-to-student guidance was performed as a scaffolding with progressive fade out; student-to-student guidance was performed as during the entire CS2TB operational phase.
Facilities	All but language (adopted IT platforms support students in all activities except language learning)	*Learning resources*: written instructions (*scripts*) on roles, task management and IT platform usage. Wiki supporting scaffolding at the beginning of the experience and, later, both self-learning and collaborative learning. *Teaching resources*: role-specific written instructions. *Space*: fully remote collaborative learning experience (i.e., *virtual space*). *Time*: one academic semester, at least.

GLAID framework component	Activated EMT competence(s)	CS2TB modelling choice
		<u>*IT Platforms*</u>: 1. CAT Tool: at least one cloud-based application guaranteeing remote CAT capabilities to students and control functions to teachers. 2. Groupware: at least one feasible solution to enable communication and coordination, to manage time availabilities, workflows of activities and wikis.

Table 3: Mapping between ITIL v3 phases and GLAID components in CS2TB

ITL v3 phase	Matched GLAID component(s)	Phase definition in CS2TB
Phase 1 – Service design	All	The service is modelled collaboratively by teachers according to three perspectives. <u>*Organizational*</u>: definition name/acronym, activity period, curriculum embedding, students/teachers enrolling strategies, training methodologies, students/teachers roles, student groupings, client types, interactions with clients, compensations for participants, payments for clients. <u>*Language-translation*</u>: the CS2TB must operate at least in one of the language pairs hosted by the MA curricula. It must offer at least three operational phases (i.e., translation, revision and client check) and comply with ISO 17100:2015 standardized procedural phases of pre-production (i.e., enquiry, quotation, negotiation, project preparation), production (i.e., translation, revision) and post-production (i.e., feedback, invoicing, payment, project closing). A proper service catalogue and adequate service provisioning strategies (i.e., how clients receive final documents) are needed as well. <u>*IT-oriented*</u>: a cloud-based, free CAT tool is the most suitable choice since it suits universities with few funds, allows student remote access and eases collaborative work, which is a high-relevant requirement in translation training (Thelen, 2016). Online cooperation and collaboration activities (e.g., communications, project tasks allocation, file sharing etc.) must be supported via groupware solutions having a low-complexity training required and (possibly) no licensing costs.

ITL v3 phase	Matched GLAID component(s)	Phase definition in CS2TB
Phase 2 – Service Transition	Structuring Facilities Group constellation	This phase refers to non-operational events happening during the service lifecycle of the CS2TB. *IT update/change* (managed by IT teachers): CAT tool version update; integration of a new application in the CS2TB's platform. *Unit role change*: pivotal in collaborative learning environment, since students can help their peers when accessing a new role. *Resource change*: addition/removal of a personnel unit. *Service validation and testing* (performed by platform administrator): test and validation of the CS2TB's platform.
Phase 3 – Service Operation	Assessment Guidance	*Service monitoring*: a delegated student/teacher implements and supervises workflow and problem management. Human resources and client relationships are managed by students.
	Structuring Interaction Facilities	*Service provision*: as in ISO 17100:2015, students perform several tasks belonging to a professional translation workflow. Teachers/platform administrators perform training and, when needed, adapt CS2TB collaboratively.
Phase 4 – Continual Service Improvement	All	This phase is regulated by the Plan-Do-Check-Act (PDCA) approach in ITIL and is based on adopted assessment strategies in order to define proper follow-up and improvement actions.

Enabling IT Platforms and Tools

Two categories of IT platforms were considered for the CS2TB: domain-specific platforms used in real translation agencies (mainly, CAT tools) and general-purpose, interaction-supporting, online platforms that work in a groupware-like fashion, as originally defined in (Ellis & Wainer, 1999). This combination is needed since even the most recent cloud-based CAT tools do not offer features specifically designed for collaborative learning or cooperative translation. CAT tools ensure workflow-based, standard-compliant, operating procedures as well as translation resource sharing and project management, but groupware-like platforms complement CAT tools with communication-oriented features (audio-video conferencing tools, textual chats, wikis, file sharing, etc.).

Memsource Academic Edition (Memsource, 2021) was selected, during the *Service Design* phase, as the enabling CAT tool because it is: free for academic purposes and cloud-based; easy to learn; provided with effective and straightforward role/workflow management features. Initially, a combination of Google Spreadsheets, Docs, and Forms (customized via Google Apps scripts) was deployed as the groupware component, so that students could manage their time availability/status and overview allocated/overloaded resources. Each participant had a personal Web page where her/his activity was monitored in terms of managed projects, translated/reviewed words and acquired academic credits. Then, during the *Continual Service Improvement* phase of the ITIL-based approach, the groupware component was revised and upgraded. A dedicated team in Microsoft Teams to support participants' perceptual, actional and lexicon bases (Clark, 1996) was activated to complement Google-based elements. Then, the team was enriched with a wiki that collects role-differentiated explanations for students and with a task planner allowing PMs to organize their interactions with both linguists and clients. This allowed adding a cooperative, scaffolding-like, wiki-based learning support, whose educational significance is gaining momentum (Huang, 2019).

The CAT tool mainly covers the *keeper* and *coordinator* functions (it allows to store and share resources such as the documents to be translated and to rank and synchronize students' activities) of that taxonomy. The combination of Google Workspace and Microsoft Teams components was required to cover the *communicator* function.

Finally, the CS2TB's tools were selected so that their components properly covered the three design areas (i.e., *communication*, *information sharing*, and *coordination*) of the Grudin's and Poltrock's activity-based taxonomy (Grudin & Poltrock, 1997). Its further extension, proposed some years later with the addition of the *configuration* and *interaction* areas (Mills, 2018) was not considered in this study since the other adopted taxonomies already provide a complete overview and motivation of the design choices.

The figure proposed in Appendix A summarizes *when* and *where* (Johansen et al., 1991), *for which function* (Ellis & Wainer, 1999), and *for which activity* (Grudin & Poltrock, 1997) the current CS2TB's platform components are used.

RESULTS AND FINDINGS

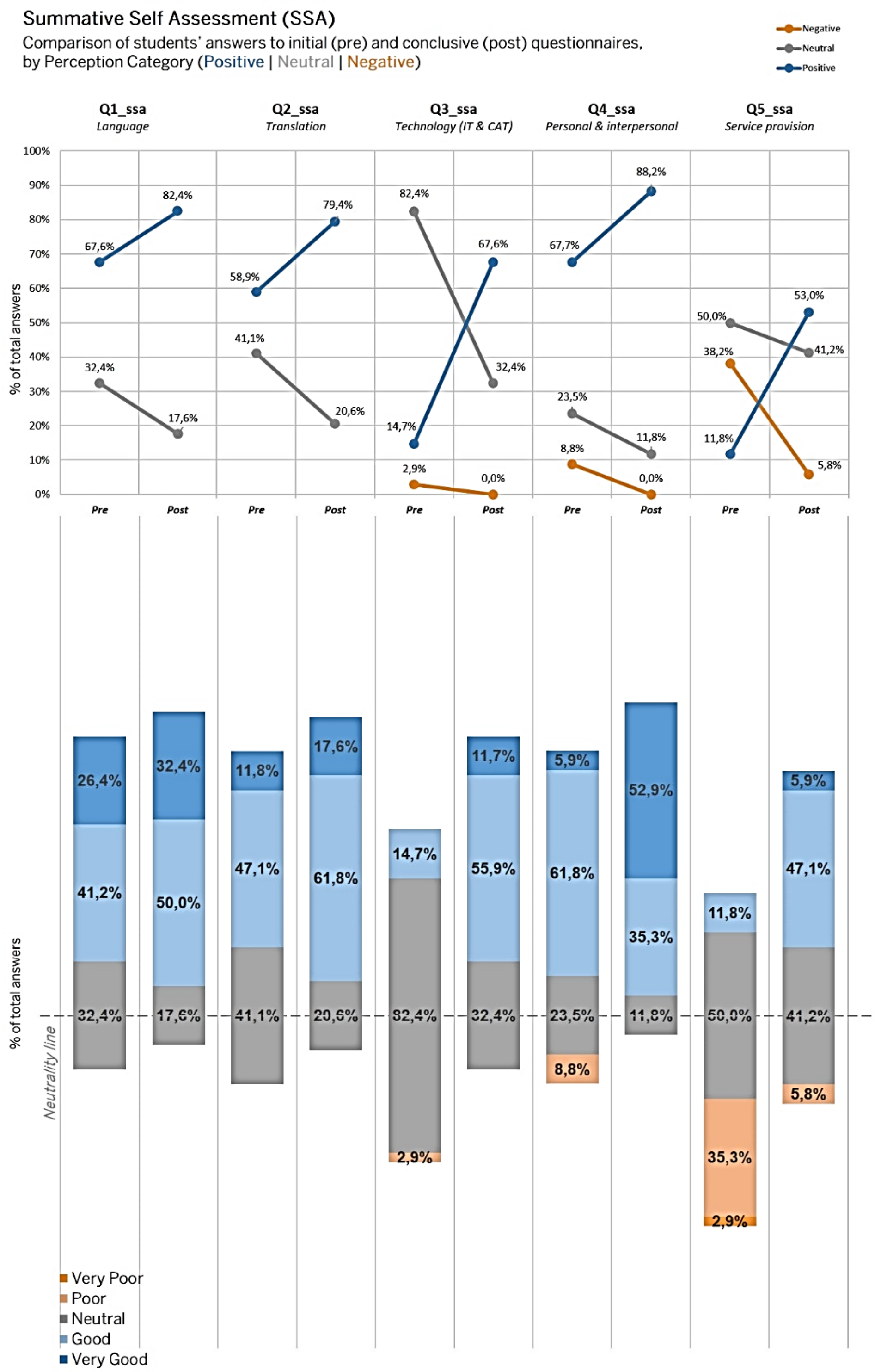
SUMMATIVE SELF-ASSESSMENT (SSA)

Students were asked to self-assess their EMT competences via an online form twice: when they enrolled in CS2TB (*pre* questionnaire) and then at the end of the collaborative experience (*post* questionnaire). A 5-point Likert scale (i.e., *Very good*, *Good*, *Neutral*, *Poor*, *Very poor*) was used, whose items were also grouped into *perception categories*, as *Positive* (*Very good* and *Good*), *Neutral* and *Negative* (*Poor* and *Very poor*). The SSA analysis compares *pre* and *post* questionnaires in Figure 2 as a series of slopegraphs for perception categories (top chart) and diverging stacked bars for Likert items (bottom chart). Question IDs and corresponding EMT competences are reported in the upper side, pre and post tests for each question are placed along the horizontal axis, while the percentage of received answers is always placed on the vertical axes. The questionnaire is reported in Appendix B.

The slopegraphs in the upper part of Figure 2 are highly effective when evaluating the trend of a quantity over time (Evergreen, 2019), which is represented as a straight line going from its value at time t to its value at time $t + \Delta t$. An upward slope indicates an increase: the steeper the slope, the higher is the change, so that the reader immediately visualizes the most significant modifications. In order to enhance readability, slopegraphs are used for perceptions categories only, as every question has three slopes at most – positive (blue), neutral (grey) and negative (red) perceptions – instead of five.

However, category-based slopegraphs do not allow assessing the impact of extreme values and that is why diverging bar charts are proposed in the lower part of Figure 2. They are centered on the so-called *neutrality line*, so that neutral options (in grey) are equally balanced amongst negative perceptions (i.e., *Strongly disagree* and *Disagree*, placed below the neutrality line, in orange gradient) and positive perceptions (i.e., *Agree* and *Strongly agree*, placed above the neutrality line, in blue gradient). Also in this case, the overall trend for every question is immediately clear (Evergreen, 2019).

If question "Q1_ssa" in the slopegraph is considered, the chart shows that 67.6% of the respondents answered with *Very Good* or *Good* in the pre-questionnaire, while this quantity increased to 83.33% in the post-questionnaire. Neutral answers decreased from 32.4% to 17.6%. No negative perceptions were provided. Every Likert item is detailed in the stacked bar charts given below.



EMT Competence area	List of questions
Language	Q1_ssa: *Self-assess your overall language competence in English*
Translation	Q2_ssa: *Self-assess your capability of translating technical texts from English into italian language*
Technology	Q3_ssa: *Self-assess your technological skills, focusings on CAT tools and other IT tools supporting translation workflow*
Personal & interpersonal	Q4_ssa: *Self-assess your personal capacity to work in team and to interact with your colleagues/peers*
Service provision	Q5_ssa: *Self-assess your capacity to negotiate and fulfill client requests*

Figure 2: Results of Summative Self-Assessment (SSA). Comparison of student perceptions via initial (pre) and conclusive (post) questionnaires

Positive perceptions (blue slopes) improved with time for all questions. Similarly, all negative (red slopes) and neutral perceptions (grey slopes) considerably decreased with time. This suggests that students self-assessed their skills as improved after the CS2TB. More specifically, as for EMT's language and translation competences (Q1_ssa, Q2_ssa), students were confident of their capabilities since the beginning (i.e., they had no negative perceptions when their involvement in CS2TB started) and further improved their perceptions during the project. The assessment of CAT and IT competences (Q3_ssa) reveals the steepest upward-sloping line. Initial neutral perceptions, mainly deriving from the absence of prior acquaintance with CAT tools, were more than halved in the *post* questionnaire and positive perceptions increased by a factor of four. Personal and interpersonal competences (Q4_ssa), whose self-assessment is particularly influenced by the collaborative scenario, present the highest positive perception, thus indicating students deem their participation in the CS2TB as highly effective. Service provisioning (Q5_ssa) presents higher neutral perceptions because, in proportion, resources involved in such an activity (i.e., PMs and, marginally, reviewers) were fewer. Nonetheless, even in this case, negative and neutral lines are downward-sloped while positive perceptions ended as 4-time higher than they started. Moreover, the students asked for new language pairs to be managed and for additional roles: this clearly demonstrates their engagement in the initiative (which would have been less spontaneous if a traditional summative individual assessment from teachers was applied).

The answers provided by the PMs show the highest improvement on question Q5_ssa: indeed, since they self-assessed their interactional skills with fictional clients were considerably improved at the end of the experience. This is confirmed also by the reports supplied by language teachers participating as fictional clients, who noted how PMs at the beginning merely focused on applying step by step the operational instructions received during the training (initial scaffolding) phase while in the following months PMs became more autonomous and proactive. For instance, PMs started to customize fictional quotations by proposing discounts to those fictional clients who sent service requests more than just once (thus indicating they paid attention to recurrent clients) or to negotiate deadlines. The second highest pre/post improvement for PMs is located on Q3_ssa, as they had to practice with a significant set of functionalities offered by the adopted platforms (thus confirming also in this case that they succeeded in managing the platforms without hindering the service provisioning deadlines). No variations are reported on Q1_ssa and Q2_ssa, as PMs were not involved in translation/revision activities.

Among reviewers, language and translation competences were slightly improved (i.e., reviewers were already confident in their skills on those topics when they applied for that role), while a considerable improvement was registered mainly on Q3_ssa (as reviewers had to work a lot with revision-assisting functionalities of the adopted platforms) and Q4_ssa (as they had to cooperate with translators when translated texts required corrections).

Among translators, the highest improvement was related to teamwork and self-organization skills, as translators were required to interact frequently with reviewers and to manage translations for CS2TB without hindering their proficiency in other exams (translation activities take longer than revision and project management).

An important consideration must be done on Q5_ssa both for reviewers and for translators: originally, the interaction with fictional clients was intended to be almost exclusively performed by PMs, but all the translation teams progressively self-organized, especially toward the end of the CS2TB experience, in such a way that before sending the fictional quotation to the client, all the involved roles discussed together about two aspects that are pivotal for the professional translation domain. First, how to leverage on previous translations on the same topics so that translators can focus on new texts only and spare time: this requires to cooperatively check in advance the available translation memories (i.e., the databases on translated texts that are managed via the CAT tools) and it could be done by translators only, instead PMs and reviewers actively participate in the discussion, too. Second, the participants started to role-play about potential company's profit margins deriving from appropriately differentiating between per-word prices for clients (i.e., company's income) and per-word translation costs (i.e., company's expenditure).

Formative Individual Assessment (FIA)

The improvement in technology skills was examined through error logs notified by the system (to clarify whether students/teachers use technological enablers effectively) and requests submitted by participants (to identify where additional support or further explanations are needed). The requests were categorized into demands for technical help about IT tools and demands for additional training about procedural/functional aspects. All events were collected during the 8-month working window of the CS2TB. Each month, a fictional client, with an approximate estimated deadline of 30 days, sent at least one request to the CS2TB.

Figure 3 examines error logs (red), technical help requests (green) and training requests (blue), in three horizontal stacked bar charts, organized by topic, by requester's role and by subject, respectively.

The top-chart breaks down error logs with respect to these topics: client management, credits awarding, social interactions (with clients, reviewers, and translators), platform access, project-related aspects (creation, management and closure), translation, revision, service provision. The errors refer to access/usage of the CAT tool and are concentrated in the first two months with a limited number (only 7 errors for the first month, with 30 participants) and then decrease further, thus indicating that the participants learned how to use the tools effectively. Similarly, technical help requests concentrate in the first months (and in a very limited number), mainly concerning technical aspects about how to use correctly the scripted Google Spreadsheets. The requests for additional training or explanations are distributed on the majority of the considered topics. Moreover, the overall number of these requests by month (12 requests for month 1, 4 for month 2, 1 for month 3) is always less than the number of participants and progressively shrinks with time. This clearly indicates that: students organized themselves in such a way that each group selected one or two members to ask questions (depending on their role) and then shared the received explanations; the introduction of Microsoft Teams (from month 2) as the core groupware component was much more suitable to students' needs. In addition, this trend seamlessly matches with the adopted approach of progressive scaffolding fade out: as soon as the teachers reduced their support and participants progressively boosted their cooperation, the overall number of help requests addressed to teachers shrank considerably. Finally, starting from month 6, requests grew again, as the CS2TB was approaching its final period and students were anxious to receive confirmations about how to achieve credits.

The mid-chart in Figure 3 reports the breakdown by requester's role: except for two requests from language teachers (as fictional clients), all the error logs and user requests came from students. The majority of errors were caused by wrong access to the CAT tool during the first month by translators, thus indicating that students who applied for that role were the least acquainted with IT aspects. IT-related issues reduced over time because students cooperated to tackle initial issues (those with better computer skills in each TT supported the others). The highest number of explanation requests is associated with reviewers in the first month, since the revision process in Memsource is quite complex and students required more training. Explanation requests coming from PMs referred mainly to project closure and service provision: this behavior was expected, as these steps require other IT tools in addition to those from the CAT field. The CS2TB collaborative approach helped tackling issues effectively, as from the third month a very limited number of events occurred. Furthermore, the gradual introduction (from month 3) of Microsoft Teams as a second groupware mitigated the complexities of scripted Google spreadsheets: it brought more effective user interfaces and tools that speeded up non-translational activities. Students' preferences are confirmed by the progressive reduction of accesses to Google workspace. Amongst Teams' functionalities, students particularly liked automatic chat messages triggered when specific actions were performed (e.g., job assignment, job completion, etc.), the task planner and the wiki. That is why it was decided to shift the second run of CS2TB to a scenario where Microsoft Teams is the only groupware.

Finally, the bottom chart of Figure 3 shows the breakdown by subject, which helps to understand whether participants encountered more difficulties in administrative topics, IT aspects or when managing the professional translation workflow. Error logs concentrate on IT subjects only, while no technical help requests were sent on administrative subjects. The process workflow collected a similar number of technical help and explanation/training requests. The number of events significantly reduced with time, thus indicating that the collaborative approach offered students a fruitful way of improving their confidence on these topics.

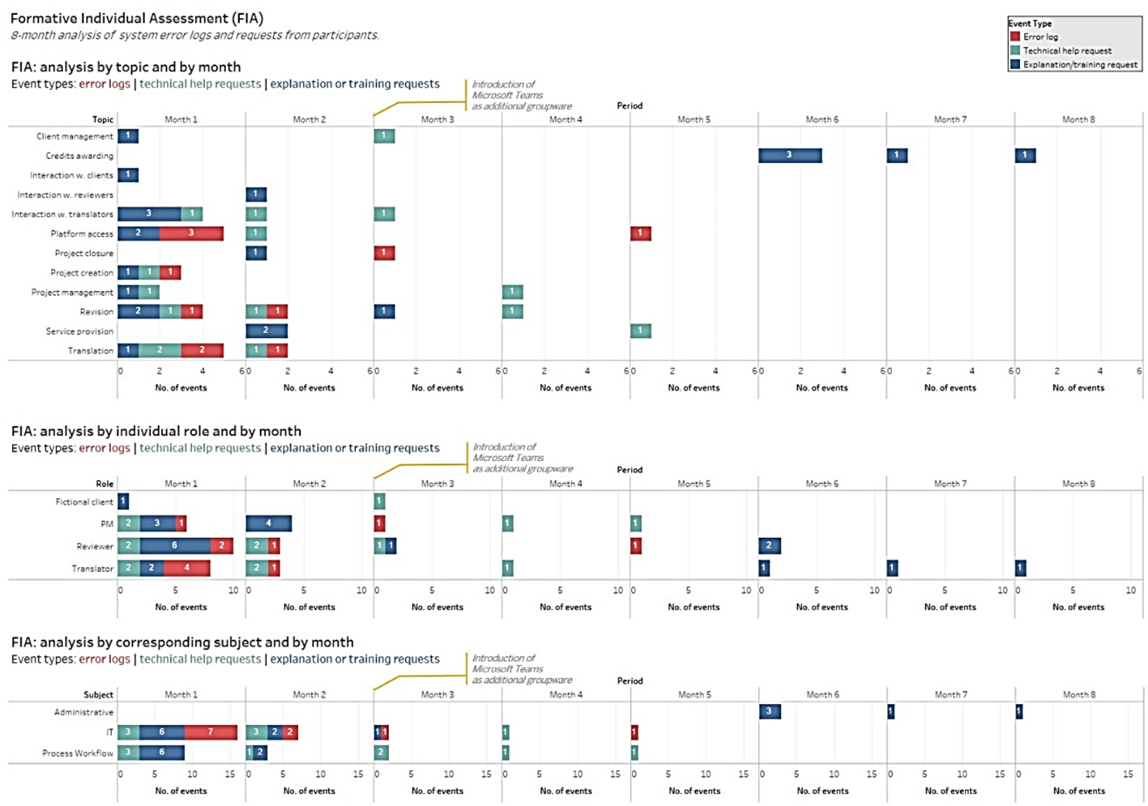


Figure 3: Formative Individual Assessment (FIA). Multiple breakdowns of monthly error logs and requests from participating students

Summative Intra-Group Peer Assessment (SIGPA)

Students with peer-supervising roles (i.e., 3 PMs and 12 reviewers) participated in a final online survey (Appendix C) to assess how their groups perceived their engagement in the bureau, according to a 5-point Likert scale. Figure 4 reports questions (bottom) and answers (top) as diverging stacked bars, centered on the *neutrality line*, so that the neutral options are equally balanced amongst negative perceptions on the left (i.e., *Strongly disagree* and *Disagree*) and positive ones on the right (i.e., *Agree* and *Strongly agree*). In this way, the overall trend for each question is immediately clear (Evergreen, 2019).

The responders considered the CS2TB capable of improving translation quality (Q01_sigpa) and, above all, IT capabilities (Q02_sigpa) and productivity (Q03_sigpa), supported by effective meetings amongst participants (Q04_sigpa). Moreover, the collaborative approach allowed allocating tasks fairly and without excessive workloads (Q05_sigpa, Q06_sigpa). Instructions from supervising peers

(Q07_sigpa) and teachers (Q08_sigpa) were perceived as useful and were applied properly. Similarly, the responders provided a significant positive assessment about how students managed to use technological enablers (Q10_sigpa). The compliance with deadlines was evaluated as positive, with a slight quantity of negative perceptions provided by reviewers who had to solicit translators to abide by their assignments, especially at the beginning of the CS2TB, thus confirming the effectiveness of the adopted group structure in keeping the bureau working. Interactions amongst students were rated very high, with all the translation teams autonomously organizing weekly online video meetings (thanks to the groupware component) to evaluate incoming tasks, scheduled activities and to distribute jobs.

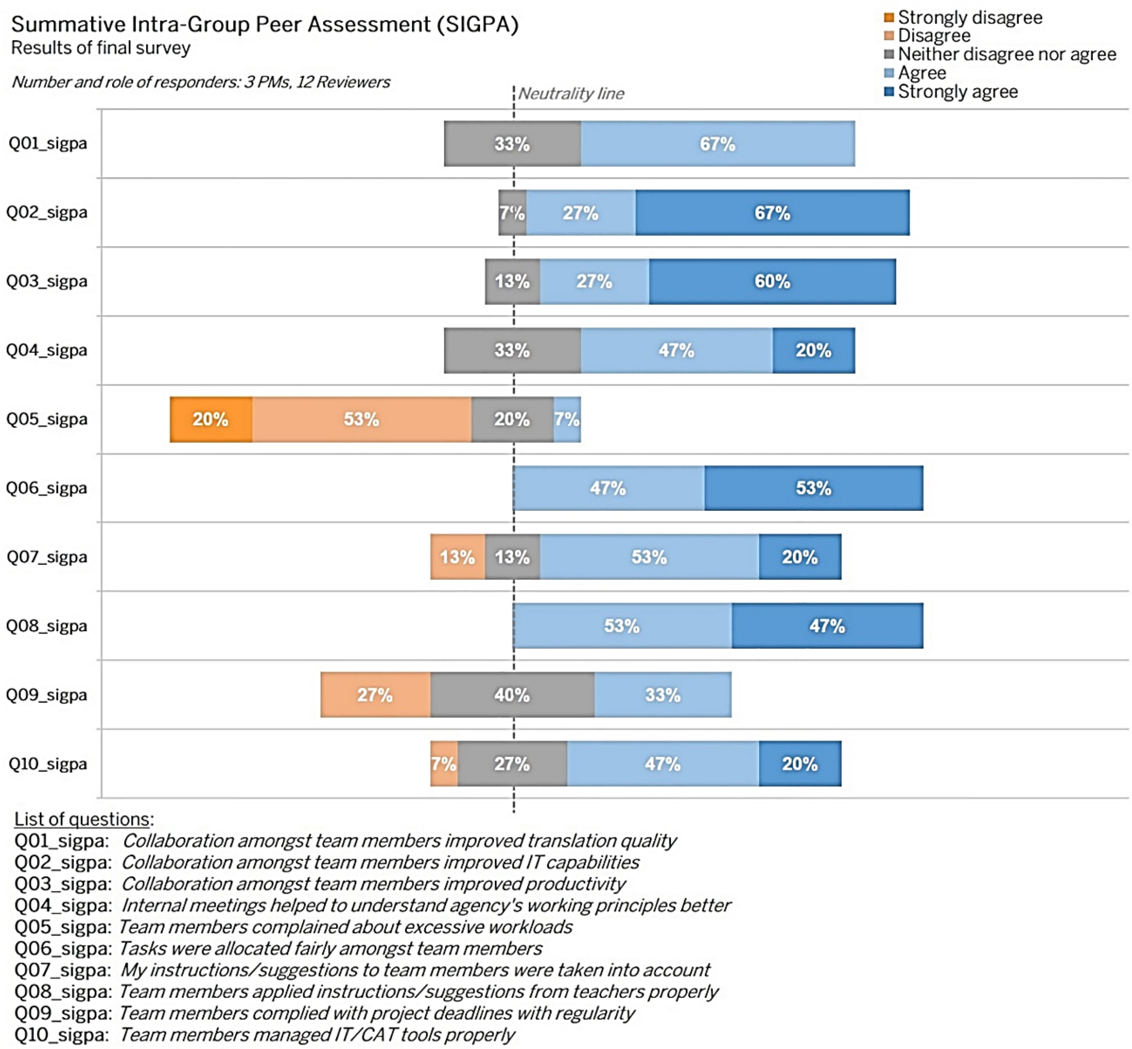


Figure 4: Summative Intra-Group Peer Assessment (SIGPA). Results of final survey amongst PMs and reviewers

DISCUSSION

IMPLICATIONS FOR EDUCATION

This study aims at supporting educators from two core perspectives: cross-disciplinary cooperation is fostered and its benefits are presented; also, improvements in students' competences are demonstrated, so that educators can ascertain the validity of CS2TB.

The most evident consequence of cross-disciplinary cooperation is related to the benefits achievable with the introduction of a more systematized usage of IT platforms with groupware functionalities. Firstly, students from non-STEM academic degrees can become more acquainted with tools, knowledge of which will be required of them by the professional sector (Malenova, 2019). Secondly, this approach helps students to overcome the hesitancy they normally have towards computer applications, thus developing a deeper and more structured competence on how to use them (X. Zhang & Vieira, 2021). Thirdly, a possibly seamless (or, at least, minimally invasive) IT platform supporting collaborative learning is fundamental to trigger team-based learning dynamics and appropriate group organizational schemes (X. Ma et al., 2020).

When considering improvements in students' competences, the achieved outcomes highlighted multiple advantages. The CS2TB is perceived by the students as a deep innovation in traditional didactic approaches and this promises to trigger even more interest and to boost their participation. This was confirmed by the high rate of enrolment requests (even if students were informed from the beginning that the participation was elective and rewarded by extra ECTS only) and by a dropout rate of less than 2% during the entire operational lifespan of the skills lab. The decision to ground competences on the EMT framework (Toudic & Krause, 2017), the de-facto standard in the field of translation teaching, helped by involving teachers from that sector, thus supporting students with professional faces they were more acquainted with. All the EMT competences were boosted, with a significant improvement in IT/technical skills and soft skills such as interpersonal relationships as well as service provisioning. The achieved development of these skills in a non-IT degree is clearly emphasized by student feedback and self-assessment results so, students effectively exploited the chance to actively experience a collaborative context mimicking their future fieldwork, thus allowing them to operate according to a hands-on approach rather than the typical seminar/webinar-based one, which provides students only with a glimpse on their professional career (typically during a seminar held by some company delegates describing how a translation agency works) without any direct contact with typical challenges and operative workflows. Additional soft skills that are pivotal to succeed in the labor market are fostered by CS2TB: students were involved in tasks requiring them to work under pressure and to experience conflict management and negotiation, which are typically required in more IT-oriented courses (Osmani et al., 2016), and they also autonomously tuned the internal organization of the translation teams that were created to manage every incoming translation service requests. Interestingly, this behavior became evident during the operational phase of CS2TB, as every translation team progressively adopted internal mechanisms that improved the simulated productivity rate and also the quality of language revision activities.

The roles assigned to participants were carefully examined during the CS2TB experience. Among students, the outcomes of summative self-assessment questionnaires clearly highlighted some role-based dependencies associated to specific skills. Those who applied as translators, and who expressed initially a quasi-neutral confidence in their language/translation skills, showed a notable improvement on average in their language and translation skills, thus confirming that translators acknowledged an enhancement triggered by the CS2TB experience on those skills. Similarly, students who applied as project managers were the only ones already confident in their ability to work in team, as it emerged by examining the self-assessment answers about personal and interpersonal skills in the pre-questionnaire. Among teachers, it is also notable that their role in these activities moved from the traditional one to that of fictional client and facilitator. By doing so, responsibilities were progressively transferred to students, according to scaffolding with progressive fade out theories (van de Pol et al., 2010).

Implications for Research

One of the core aims of this research study is to propose a novel and more technology-mediated approach for technical translation teaching in universities. In this educational sector, the more the ICT progresses, the wider the gap between market and educational offering has tended to become

(Ivanova, 2016). This is due because, on the one hand, professional translation agencies, bureaus and companies demand more IT-acquainted students, who should have not only skills on specific (CAT) computer applications but also soft skills (e.g., team-working, interpersonal capabilities, etc.) while, on the other hand, academic programs still mainly focus on technical operational knowledge of CAT tools and traditional language/translation teaching for several reasons (e.g., absence of professional teaching figures from the computer engineering sector, limited amount of time, organizational constraints).

The present study provides an attempt to show how to merge appropriately multiple elements that are either currently available only in a very limited number of academic institutions and very often with excessively varied settings (such as the few simulated translation bureaus activated in a few EU universities (Buysschaert et al., 2017)), or widely exploited in other educational sectors (such as the CSCL perspective, largely adopted in STEM and definitely less in technical translation teaching (Biuk-Aghai & Venkatesan, 2013)), or even completely new because they are borrowed from a different domain (as the service-lifecycle-based ITIL v3 methodology (van Bon, 2007)). Not only design, implementation and management aspects are considered in this paper, but also multi-criteria assessment, since the complexity of referred frameworks as well as the inherent difficulty encountered when CSCL experiences have to be evaluated (Hernández-Sellés et al., 2020), require a multi-faceted solution. That is why this study exploits more than one single assessment technique, which is, instead, typically considered in the majority of similar studies. In this way, researchers can ascertain the combined impact of teacher assessment, self-assessment, and peer assessment in such a peculiar application context. Understanding how to properly assess the efficacy of similar approaches can also increase the chances of a wider deployment of enhanced skills labs such as CS2TB.

Another significant aspect to be mentioned is represented by the role of cooperation between language/translation teaching and computer engineering promoted in this study. It has been demonstrated that throughout the entire lifecycle of a collaborative skills lab like CS2TB, specifically tailored to a non-IT educational sector, the role of IT professionals and computer engineers is not marginal. Usually, these cross-disciplinary collaborations necessitate allocation to computer engineers the activities for setting up, customizing, operating, and maintaining IT platforms. However, the contributions of those professional categories can be helpful also during the design stage and the evaluation assessment phases. Therefore, it is expected that experiences like the CS2TB foster a broader adoption of such an intertwined perspective.

CONCLUSION

Current trends in the technology-driven translation industry suggest that cooperative approaches can be profitably exploited to close the gap between MA curricula in technical translation and the professional market. A design methodology to create a Computer-Supported Collaborative Simulated Translation Bureau (CS2TB) has been proposed in this paper and a set of three research questions (RQs) has been defined. In this regard, the CS2TB has been examined in terms of intended context of use and user groups, to clearly identify the participants and to adapt CS2TB's featuring aspects to them (RQ1). Domain-specific theoretical foundations, along with the expected common knowledge base of the involved students and teachers have been thoroughly investigated in order to ground the CS2TB on them in terms of design goals, design approaches and enabling IT platforms with groupware functionalities (RQ2).

An 8-month-long CS2TB deployment in a translation-teaching MA curriculum at the University of Salento (Italy) has been examined as the case study, along with complementary evaluation strategies to quantify the approach effectiveness (RQ3). The achieved outcomes show a relevant increase of both learning effectiveness and cooperation efficacy for all involved students, in each role. Student questionnaires showed that IT/technical skills, as well as personal and interpersonal skills, benefitted the most from the CS2TB experience. The proposed hands-on approach was perceived by the students as the closest experience to their forthcoming professional career they had during their study path, and this motivated them to participate even more actively.

In addition, encouraged by the novelty of the approach, students immediately recognized the usefulness of cooperation; they did not complain about assigned workload or service negotiation as they were, instead, eager to demonstrate their capability to work under pressure and to comply with deadlines. In order to achieve this target, soon after the beginning of the CS2TB experience, students started to autonomously organize their translation teams so that each incoming service request was managed timely and effectively.

Limitations and Suggestions for Future Research

Being the first of its kind in this sector, this study is not without limitations. More specifically, the adopted assessment approaches (i.e., summative self-assessment, formative individual assessment, and summative intra-group peer assessment) could be further enhanced and complemented by comparing the CS2TB experience with a control group where the traditional approach is followed. However, this technique is not straightforward to implement (and that is the reason why it was not considered, at least in this first study): being so novel, the CS2TB approach acted as a powerful call for students, who applied to enroll in a considerable number. The CS2TB's time duration (i.e., eight months) also hampered the achievement of a traditional control group as a comparable period of activity would exceed that of traditional courses. Therefore, this casts the need of future research on how to properly tune the CS2TB so that a control group can be constructed in a relatively simple way. In addition, questionnaires used during the summative self-assessment phase as well as during the summative intra-group peer assessment phase could be enriched with open-ended questions. This would introduce a broader range of quantitative responses from the participants, thus gathering a broader spectrum of opinions and more insights on students' behaviors and learning outcomes. Collected qualitative responses could be then categorized and used to widen the adopted set of close-ended questions.

Another area where future research is possible, and where actually it has already started, is the further enrichment and customization of the adopted IT platforms: additional elements such as a chatbot are already under test and validation; other assets, such as the usage of augmented reality solutions are under evaluation.

Moreover, the CS2TB approach can be further investigated in terms of achievable soft skills: a potential research development could refer to the improvement of its simulation fidelity. This could be targeted by introducing new aspects such as enrolment interviews (thus mimicking the true application procedure a recently graduated student would follow to enter the professional world), specific software applications for customer relationship management and human resource management.

List of abbreviations

CAT: Computer-Assisted Translation

CS2TB: Computer-Supported Collaborative STB

CSCL: Computer-Supported Collaborative Learning

EMT: European Master's in Translation

FIA: Formative Individual Assessment

GLAID: Group Learning Activities Instructional Design

ITIL: Information Technology Infrastructure Library

MA: Master of Arts

MT: Machine Translation

SIGPA: Summative Intra-Group Peer Assessment

SSA: Summative individual Self-Assessment

STB: Simulated Translation Bureau

TT: Translation Team

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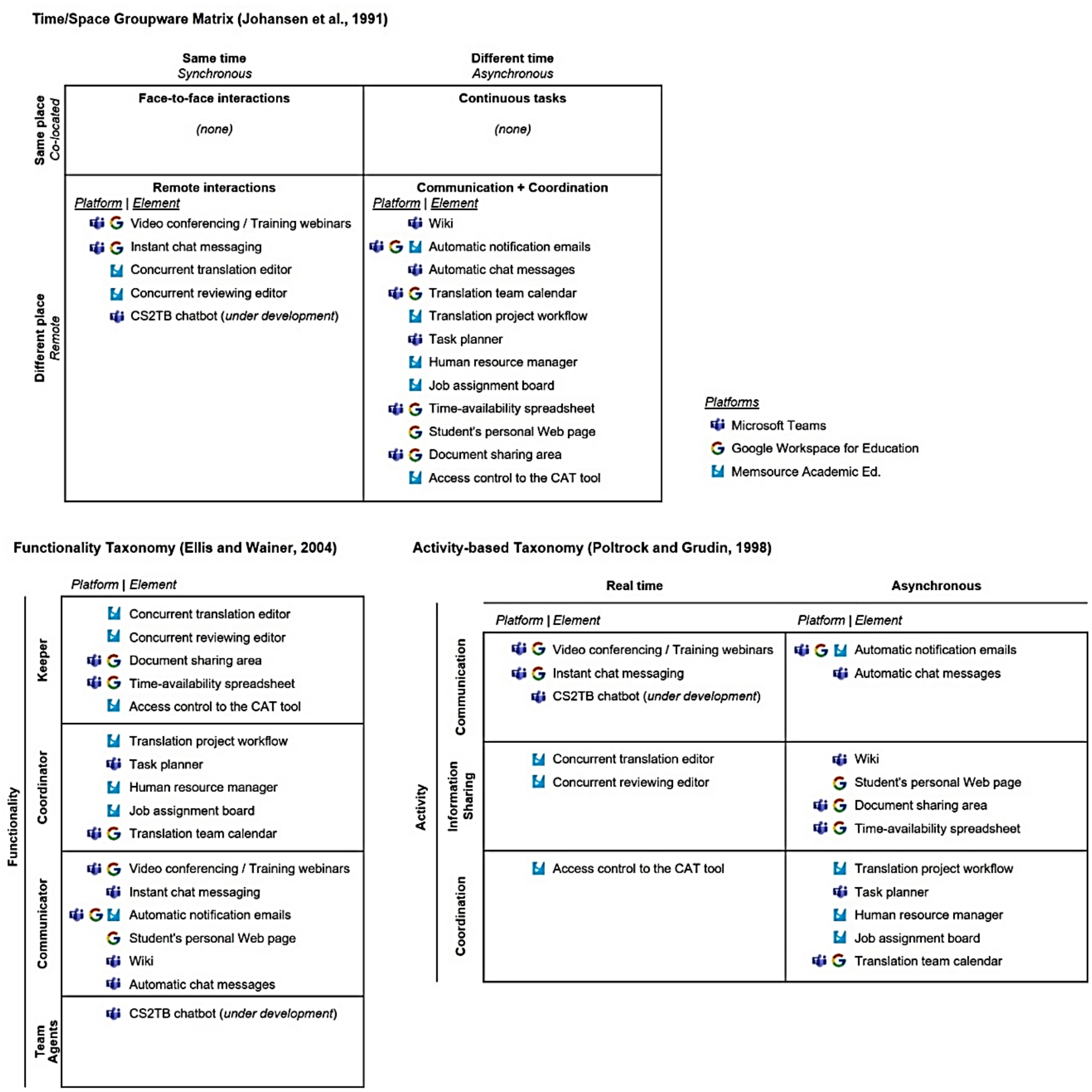
APPENDIX A

DETAILS ON THE ENABLING IT PLATFORMS AND TOOLS

The following figure details how both groupware (i.e., Microsoft Teams, Google Workspace for Education) and computer-assisted translation tools (i.e., Memsource Academic Ed.) are examined in CS2TB depending on three complementary perspectives: time/space (top) (Johansen et al., 1991), functionalities (bottom, left) (Ellis & Wainer, 1999) and activities (bottom, right) (Grudin & Poltrock, 1997).



Appendix A: Detailed view of technological enablers in CS2TB.

APPENDIX B

SUMMATIVE SELF-ASSESSMENT (SSA) QUESTIONNAIRE

- Q1_ssa: Self-assess your overall language competence in English
- Q2_ssa: Self-assess your capability of translating technical texts from English into Italian language
- Q3_ssa: Self-assess your technological skills, focusing on CAT tools and other IT tools supporting the translation workflow
- Q4_ssa: Self-assess your personal capacity to work in team and to interact with your colleagues/peers
- Q5_ssa: Self-assess your capacity to negotiate and fulfill translation and revision requests from clients

Adopted Likert scale: 1. Very poor, 2. Poor, 3. Neutral, 4. Good, 5. Very good.

APPENDIX C

SUMMATIVE INTRA-GROUP PEER ASSESSMENT (SIGPA) QUESTIONNAIRE

- Q01_sigpa: Collaboration amongst team members improved translation quality
- Q02_sigpa: Collaboration amongst team members improved IT capabilities
- Q03_sigpa: Collaboration amongst team members improved productivity
- Q04_sigpa: Internal meetings helped to understand agency's working principles better
- Q05_sigpa: Team members complained about excessive workloads
- Q06_sigpa: Tasks were allocated fairly amongst team members
- Q07_sigpa: My instructions/suggestions to team members were taken into account properly
- Q08_sigpa: Team members applied instructions/suggestions from teachers properly
- Q09_sigpa: Team members complied with project deadlines with regularity
- Q10_sigpa: Team members managed IT/CAT tools properly

Adopted Likert scale: 1. Strongly disagree, 2. Disagree, 3. Neither disagree nor agree, 4. Agree, 5. Strongly agree.

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