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LIFECYLE DESIGN AND EFFECTIVENESS EVALUATION FOR SIMULATED TRANSLATION AGENCIES

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Abstract

Current demands from technology-based translation industry and market require adequate educational offerings to be provided at Master's Level Degree. Therefore, novel and more engaging strategies for complementing traditional theoretical lessons and laboratory sessions on computer-assisted translation are needed to improve students' skills and technical acquaintance, as suggested by the European Master's in Translation Competence Framework. The Simulated Translation Agency (STA) holistic approach promises to be a key enabler capable of motivating students to manage a fictional company according to a professional translation workflow. In this paper, a methodology based on Business Process Modelling (BPM) for designing cloud-enabled STAs grounded on competence frameworks and professional standards is proposed, along with a set of metrics targeting student self-assessment and agency productivity. The

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"STARS" agency, designed and deployed according to the proposed methodology in an Italian university, is described in detail as a test case. Achieved results demonstrate the effectiveness of this approach as well as the significant engagement of participants.

Keywords: translation teaching, simulated translation agency, cloud-assisted translation, DMEMO cycle, dynamic teaming.

1. INTRODUCTION

The inclusion of technological competences and computer literacy into Master's level degree (MAs) curricula for translators has gained considerable significance in the last years. Several factors keep fuelling this trend, mainly because the *"translation practice has become increasingly technology driven and technology dependent"* (Rothwell and Svoboda, 2019). Indeed, Information Technology (IT) plays such a pivotal role also in the field of translation – and particularly in specialised and technical translation (Zhang and Hui, 2015) – that the initial definition of *"technological revolution"* (Olvera Lobo et al., 2007; Pym, 2013) has now risen up to that of *"disruptive technological change"* (Christensen, 2015) for the translation industry and market. Consequently, the demand for technology-aware (and technology-capable) translators is rising, as they can acquire a competitive professional

advantage in this scenario by properly managing and exploiting tools and technologies along the entire lifecycle of translation service provisioning (Rothwell and Svoboda, 2019).

CAT (Computer-Assisted Translation) tools (Bowker, 2002) and MT (Machine Translation) engines (Alcina, 2008) have become essential components of the so-called *"digital translator's workbench"* (Delpech, 2014), as they can, when properly exploited, *"ensure high-quality output to human translators"* and delegate to machines the research for *"a significant gain in productivity"* (Barrachina et al., 2009). Therefore, several universities have enhanced their programmes that already addressed linguistic, translation and intercultural skills with competences on technology-assisted translation (Gaspari et al., 2015). Even if this trend has yet to gain larger visibility, a lively stream of pedagogical analyses on novel didactic methodologies that propose more systematic approaches based on *Competence Frameworks* (Göpferich and Jääskeläinen, 2009; Toudic and Krause, 2017) has recently enriched the academic context. These approaches are based on the assumption that *"translation competence is not a monolithic knowledge structure but rather a set of*

sub-competences (for example, linguistic competence, domain knowledge, research skills)" (Krüger and Serrano Piqueras, 2015).

Competence frameworks aim to increase students' familiarisation with professionalising and market-inspired translation scenarios (Kiraly, 2016), thus representing an emerging educational paradigm to engage trainees in realistic contexts, where translational capabilities and additional skills (e.g., team work, project planning, time management) can be tested. A very promising, yet in its infancy, enabler of this paradigm is represented by Simulated Translation Agencies (henceforth, STAs): fictional translation bureaus, totally or partially managed by students, set up and included in MA translation teaching programmes (Thelen, 2016). Some STAs are currently operating in Europe (Buysschaert et al., 2017), although they do not share a unique reference model and exhibit their own set of targeted skills to be developed by students.

In this paper, two core research purposes are aimed to: first, defining a rigorous STA lifecycle model and, second, proposing how to evaluate the STA holistic approach via a set of suitable metrics.
The proposed design approach is rooted on

competence frameworks and situated translation, as suggested by Buysschaert et al. (2017), and it draws inspiration from the Business Process Management (BPM) theory (Dumas et al., 2016), thus targeting a systematisation of its replicability in other universities.

The proposed set of metrics is intended to help teachers and educators to evaluate the STA approach in terms of two complementary perspectives: 1) self-assessment of student's skills and 2) STA's productivity evaluation.

A STA named "*STARS*" (*Simulated Translation Agency Run by Students*), deployed at the University of Salento (Lecce, Italy) starting from May 2019, is presented and adopted as the validation case study for both the design methodology and metrics.

The paper is structured as follows: Section 2 focuses on competence frameworks and STAs. Section 3 introduces the proposed STA lifecycle design approach along with the suggested set of evaluation metrics. Section 4 presents the STARS case study, whose validation is thoroughly examined in Section 5. Section 6 is devoted to conclusions.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E,* 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

2. COMPETENCE FRAMEWORKS AND STAs FOR TRANSLATION TEACHING

2.1 Competence Frameworks and Models

Technology advancements are changing not only the nature of translation (Kiraly, 2015; O'Brien, 2012) but also the translation teaching sector. Researchers and educators agree on the necessity of integrating translation curricula with technology-oriented contents (Bowker, 2002; Olohan, 2011) as "*ideally, students should make use of all the possible translation technologies from the very beginning of their training*" (Jiménez-Crespo, 2014). Although there is still a considerable debate on potential limitations of translation-assisting technologies — such as loss of focus on the overall textual perspective when using CAT Tools (Christensen, 2015), need to post-edit machine-translated texts (Way, 2018), data-privacy concerns for cloud-based applications (Choudhury and McConnell, 2013) —, their impact on translator's cognitive activity has been repeatedly highlighted (Pym, 2013). Consequently, several universities have introduced courses dedicated either to CAT tools in general or to specific translation software applications, usually provided as laboratorial activities (Austermuehl,

2013; Kenny, 1999; Zhang and Zhang, 2013).

However, in order to allow students to experience more effectively a real professional environment, standard courses on CAT tools are not enough (Malenova, 2019) and a broader attention to the various competences required to modern translators is rising up. This perception is grounded on the Situated Translation (Risku, 2013) theoretical framework, according to which the "*translation competence is based on the situated development of intelligent solutions for particular problems arising in specific situations*", thus asserting that a technology-driven working environment impacts on how a translator works, even from a linguistic perspective.

Situated translation has led to the definition of several competence frameworks, such as the Göpferich's model (Göpferich and Jääskeläinen, 2009) and the European Master's in Translation (EMT) model (Toudic and Krause, 2017). The EMT pursues the creation of a network of best European MA translations training courses that fosters students' skills in five competence areas: language and culture, translation, technology, personal and interpersonal, service provisioning.

Competence frameworks have started to shape in a different way translation teaching curricula in the last years, thus leading to a wider didactic offering (Kourouni, 2016; Shuttleworth, 2017; Thelen, 2016) that goes beyond mere courseware updates driven by the latest CAT tool version adopted by the translation market (Shuttleworth, 2017). One of the latest propositions of competence frameworks is represented by a pedagogical approach where students are challenged to be involved in a STA that represents a professionalising holistic training context (Krüger and Serrano Piqueras, 2015).

2.2 Simulated Translation Agencies (STAs)

In a STA, students manage a fictional agency (as an intra-/extracurricular activity) along the entire translation service-provisioning pipeline. Therefore, traditional training is complemented by learning-by-doing experiences on additional elements (e.g., interaction with clients, teamwork, document management). Students can develop professionalising skills and awareness about actual demands from industry and market, too. The main aim of a STA is "*to acquire all the required professional skills, as listed in the new EMT set of*

competences, all within a single exercise" (Buysschaert et al., 2018) and to enrich students CVs by making them more suitable to the market. Very few forerunner universities proposed initial STA experiences in the late 90s and a first implementation on a larger scale dates back to 2014 with the Tradutech/OCTC Erasmus+ project (Tradutech, 2015), which addressed collaborative translation training across 7 European universities.

Subsequently, in order to move beyond STAs organised by individual universities, the International Network of Simulated Translation Bureaus (INSTB) (Buysschaert et al., 2017) has been founded as a federation of a dozen European universities that, however, exhibit a variegated educational offering. On the one hand, this allows both participating and organizing institutions to experiment different solutions/approaches and to ensure the STA fits to their specific context. On the other hand, however, this makes the scenario considerably heterogeneous since each STA decides autonomously whether focusing more on translational aspects rather than on project and business management tasks or vice versa (Buysschaert et al., 2018). The same variety can be experienced in service provisioning, as each STA

manages clients differently (e.g, fictional vs real) and draws input texts (with different file format preferences, too) from different sources (e.g., internal vs publicly available vs private document corpora). The adoption of specific software applications and tools, as well as the decision to rely on cloud-based instead of locally hosted solutions, is another degree of variability. Similarly, student assessment and rewarding are managed in various ways.

To evaluate the STA pedagogical experience, INSTB organisers launched a survey in 2018 across participating universities to evaluate how students develop self-assessment capabilities after their experience in a STA (Fernandez-Parra et al., 2018) via a pre-post comparison process. The survey demonstrated that STAs have positive effects and that the pre-post comparison of student self-assessment is an effective evaluation opportunity but the effectiveness assessment of the different STA configurations is still worth of investigation.

In such a scenario, where very few STAs exist and operate according to heterogeneous policies with variegated pedagogical targets, a complete STA design methodology is proposed to benefit from

typical BPM (Business Process Modelling) approaches and to ease a wider adoption of STAs.

3. THE PROPOSED APPROACH

3.1 Design criteria and methodology

Setting up an effective STA that represents a professionalising skills-lab for enrolled resources is a complex process, as it requires several activities ranging from the involvement of teachers and students to the compliance with professional translation workflows and business strategies. Moreover, different implementation strategies can be followed, depending on the specific educational context. Therefore, a systematisation of the design procedure is advisable, so to make it suitable for heterogeneous academic scenarios and to foster a wider integration of STAs in MA curricula.

It is suggested, for that end, to ground the STA design on BPM (Business Process Modelling) theory, which is typically referred to when a business process lifecycle has to be modelled, executed and improved. Amongst several multi-step design approaches that exist nowadays, the DMEMO (*Define*, *Model*, *Execute*, *Monitor*,

Optimise) cycle (BPM Resource Center, 2014) has been adopted in this research work. The DMEMO cycle starts by defining the problem in terms of targets, requirements and constraints. Then, a process is modelled on top of those definitions and executed according to the model. A monitoring phase then follows, aimed at periodically checking the process compliance against a set of evaluation metrics. Finally, monitoring outcomes are used to introduce improvement interventions on modelling aspects (or even at the process definition stage), before the cycle can start again.

Figure 1 tailors the DMEMO cycle to STAs. If required by a specific academic context, modelling choices can be detailed further or generalised more, but each phase of the cycle has to be implemented. Each full run of the cycle should be associated to an iteration of the STA. For instance, if the STA is expected to operate for a semester, its optimisation stage should be performed at the semester's end, thus contributing new elements for the next academic year.

The *Define* phase, that should be performed by teachers only, is dedicated to identify the following core aspects.

1. *Targeted skills*: at least a subset of each EMT's competence area (European Commission, 2018).
2. *Purposes*: to engage students in a STA based on situated translation and competence frameworks (Buysschaert et al., 2017); to define a proper set of evaluation metrics for the STA.
3. *Business modelling strategies*: the STA must rely on a business model, which is the "*representation of the value logic of an organisation in terms of how it creates and captures customer value*" (Fielt, 2013). Therefore, the Business Model Canvas (BMC) framework (Osterwalder and Pigneur, 2010) is suggested. The BMC is a widely-shared, non-sectorial, holistic approach to identify, describe, visualise and improve a business model. Thanks to its easiness (it can be sketched by filling in a template[1]), the BMC can be used even by students, if the entire STA modelling phase is allotted to them (Buysschaert et al., 2017).

The *Model* phase can be managed either by teachers

[1] https://canvanizer.com/new/business-model-canvas

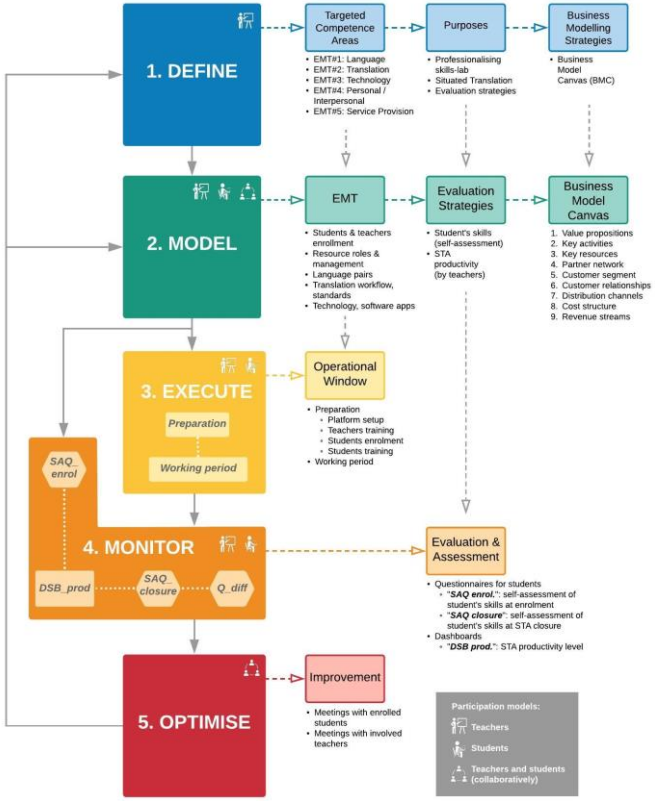
or by students (if the maximum degree of autonomy is planned for the STA) or even collaboratively, by involving external entities (e.g., prospected clients or translation professionals), too. However, collaborative modelling strategies are advisable especially after the first DMEMO cycle. During this phase, the following aspects have to be set out:

1. students and teachers;
2. language pairs;
3. translation workflow and standards;
4. resource roles and management;
5. technology and software applications;
6. BMC elements (e.g., service offering, key activities, customer segments, revenue streams);
7. evaluation strategies: (at least) student self-assessment and STA effectiveness assessment.

The *Execution* step is the actual working period of the STA: it involves teachers (as supervisors and/or administrators) and students (as resources). It must comprise a preparatory stage (for setting up the platform as well as enrolling and training students) and its time duration can be tuned or modified after the initial DMEMO cycle.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

Figure 1. Application of the DMEMO cycle to the STA lifecycle.



The *Monitor* phase enacts evaluation strategies amongst teachers and students to assess deviations from expected targets. Monitoring should follow the *Execution* phase but, in the STA context, it is

advisable to make the two stages partially overlapping (Figure 1). Student self-assessment must be performed twice: at the enrolment ("*SAQ_enrol*"), to allow students evaluating their capabilities before the participation to the STA, and after closing STA operational window ("*SAQ_closure*"), to determine whether students appraise any improvement in their skills thanks to the STA. Productivity has to be monitored all along the STA operational window ("*DSB_prod*").

Finally, the *Optimise* stage requires evaluating the suitability of any improvement intervention based on monitoring outcomes and it should be performed collaboratively.

3.2 Evaluation metrics

3.2.1 Student self-assessment of competences

Student must appraise their skills and competences before and after the STA. It is suggested to define a questionnaire dealing with covered EMT's competence areas (at least one question per area) and to provide the same questionnaire to students twice: at the enrolment stage and after the STA closure. Likert scales (Johns, 2010) should be used

to make answers comparable. A viable configuration is to adopt a 5-point, level-of-quality scale (Vagias, 2006) that offers the neutral midpoint to responders (Tsang, 2012). Answers from the two questionnaires should be evaluated by examining variations in assessment levels for each competence area.

3.2.2 Teacher assessment of STA productivity

It is pivotal to evaluate the achieved STA productivity (as it happens in a real company) and to determine any potential hindering factor. Teachers should perform this step and then debate results with students during optimisation meetings. While student assessment should rely on questionnaires, productivity quantification should take advantage of visual dashboards that provide teachers with useful insights and that are more helpful when students have to be involved, too. Productivity analysis is a typical aspect of company management and it assumes even greater relevance in STAs, which represent the first professionalising context for the majority of students, whose lack of expertise could influence agency's effectiveness (students could underestimate, unwittingly, specific aspects that are pivotal in a real agency).

The following elements should be quantified (at least):

- distribution of jobs and its correlation with resource role and resource time availability;
- discarded-vs-completed jobs ratio;
- completed-vs-assigned jobs ratio.

4. CASE STUDY: "STARS"

4.1 Overall aspects

The proposed DMEMO cycle has been enacted as a curricular project activity in the MA in Technical Translation and Interpreting at the University of Salento (Lecce, Italy) from February 2019 to January 2020[2]. It has been evaluated according to the metrics described in Section 3.2. The project is named "STARS" (*Simulated Translation Agency run by Students*). Two teachers and 30 students have participated to the agency (Subsection 4.4).

From a linguistic and translation perspective,

[2] In late 2019, STARS has applied successfully to INTSB. The next DMEMO cycle was scheduled for March 2020 but it has started in July 2020 due to COVID-19 pandemic.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

STARS has operated in the EN-IT language combination for the healthcare translation domain. Freely accessible HTML texts from the UK National Health System (NHS)[3] Website have been used as source documents because students are trained in health-related technical translation during their curricular courses. Additional language pairs and source domains will be introduced in 2020.

4.2 Technological enablers

Memsource Academic Edition[4] has been selected as the CAT platform since it is: 1) free for educational purposes, 2) cloud-based and scalable, 3) characterized by a steep (i.e., short) learning curve, 4) provided with basic QA features, customisable translation workflow and user roles. However, a STA should also need a Translation Workflow Management System (TWMS) that offers Human Resource Management (HRM) and Customer Relationship Management (CRM) capabilities in order to mimic truly a professional scenario. These tools allow controlling negotiations with clients, allocation of resources and budget/productivity

[3] https://www.nhs.uk/

[4] https://www.memsource.com/academic/

management. The adoption of professional TWMSs (maybe granted free for academic purposes) seems promising, as investigated recently (Motiejūnienė and Kasperavičienė, 2019), but an alternative approach has been followed in STARS, in order to avoid an additional, consistent learning effort for students who are not expected to train on these topics during their MA. A set of required core functions has been identified and implemented by using a simpler IT enabler already acquainted by students (i.e., a combination of Google Spreadsheets, Docs and Forms) and properly customised (via Google Apps scripts) to exhibit HRM/CRM features. The same solution can be exploited in those MAs where no training on TWMSs is planned.

HRM features are presented to PMs as an overall time planning sheet (fed by personnel via a Google Form) for assessing the current agency's status (by resource and by week) thanks to a gradient colour scale (Wexler et al., 2017). Week views are automatically sliced down and PMs can reserve resources by week. Allocated and overloaded resources are identified graphically (Figure 2). Resources who applied for a default role can receive jobs for other roles if requested by PMs (e.g.,

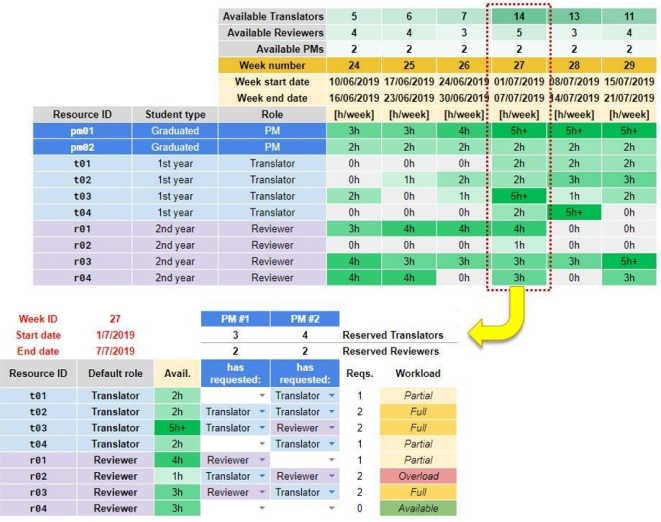
compare resources #5 and #8, Fig. 2). Workload significance is estimated depending on assigned tasks and declared availability. Compare, for instance, resources #8 and #9 (Fig.2): they both have two tasks assigned but resource #8 declared a very limited weekly availability and, therefore, an overload alert is shown in red.

Each resource has a dedicated Web page where her/his activity is monitored and the current amount of acquired extra-curricular credits is shown. In order to increase communication and time organization of personnel, the adoption of Kanban-style applications has emerged as a potential optimisation during the *Optimise* phase of the first DMEMO cycle.

CRM features and project financial management is offered via another set of script-customised Google Spreadsheets, where PMs can estimate costs and profits for each customer requests. Costs are: 1) calculated with respect to average productivity rates (*words/h*) and actual market tariffs (*EUR/word*); 2) differentiated by service type (t*ranslation/review*) and required expertise (*rookie/standard/expert*). Suggested quotations are provided automatically, depending on estimated profit margins. PMs are

then suggested by the script whether accepting the job, negotiating different conditions or discarding the job. Before a job is finally accepted, the script also notifies PMs whether available resources (up to the pre-agreed deadline) are enough to perform the job in time or the deadline has to be postponed. These procedures comply with the ISO 17100:2015 standard (ISO, 2015). Finally, PMs have been instructed on how to use a free online creator of pro-forma invoices, thus mimicking real invoicing procedures.

Figure 2. HRM-like customised Google Spreadsheets for PMs in STARS. Overall availability (top) vs sliced-down view of week #27 (bottom).



		Available Translators	5	6	7	14	13	11
		Available Reviewers	4	4	3	5	3	4
		Available PMs	2	2	2	2	2	2
		Week number	24	25	26	27	28	29
		Week start date	10/06/2019	17/06/2019	24/06/2019	01/07/2019	08/07/2019	15/07/2019
		Week end date	16/06/2019	23/06/2019	30/06/2019	07/07/2019	14/07/2019	21/07/2019
Resource ID	Student type	Role	[h/week]	[h/week]	[h/week]	[h/week]	[h/week]	[h/week]
pm01	Graduated	PM	3h	3h	4h	5h+	5h+	5h+
pm02	Graduated	PM	2h	2h	2h	2h	2h	2h
t01	1st year	Translator	0h	0h	0h	2h	2h	2h
t02	1st year	Translator	0h	1h	2h	2h	3h	3h
t03	1st year	Translator	2h	0h	1h	5h+	1h	2h
t04	1st year	Translator	0h	0h	0h	2h	5h+	0h
r01	2nd year	Reviewer	3h	4h	4h	4h	0h	0h
r02	2nd year	Reviewer	0h	0h	0h	1h	0h	0h
r03	2nd year	Reviewer	4h	3h	3h	3h	3h	5h+
r04	2nd year	Reviewer	4h	4h	0h	3h	0h	3h

			PM #1	PM #2		
Week ID	27		3	4	Reserved Translators	
Start date	1/7/2019		2	2	Reserved Reviewers	
End date	7/7/2019					
Resource ID	Default role	Avail.	has requested:	has requested:	Reqs.	Workload
t01	Translator	2h		Translator	1	Partial
t02	Translator	2h	Translator	Translator	2	Full
t03	Translator	5h+	Translator	Reviewer	2	Full
t04	Translator	2h		Translator	1	Partial
r01	Reviewer	4h	Reviewer		1	Partial
r02	Reviewer	1h	Translator	Reviewer	2	Overload
r03	Reviewer	3h	Reviewer	Translator	2	Full
r04	Reviewer	3h			0	Available

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E,* 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

4.3 Procedural pipeline

The working process for STARS is depicted in Figure 3: for each actor (i.e., language teachers, platform administrator, PMs, translators/reviewers – and fictional clients) corresponding activities are represented in the same colour (or in grey if more than one actor is involved at the same time). On the left, activities are time-referenced and related to the DMEMO cycle. Since this was the first cycle for STARS, the *Define* and *Model* phases have been managed by teachers only, while *Execute*¸ *Monitor* and *Optimise* stages have been performed according to Section 3.1.

More specifically, the preparatory sub-phase (two months) has required setting up Memsource, training involved language teachers, providing students with online application forms, enrolling applicants in Memsource by role, training students and creating fictional clients. Before the official opening, enrolled students have been requested to fill in the *SAQ_enrol* self-assessment questionnaire.

During the working window (7 months), language teachers have provided assistance to students (if

needed) and managed fictional clients, while the platform administrator managed the monitoring dashboard (*DSB_prod*). Each fictional client is assigned to a PM and negotiates service terms and conditions with her/him. Once an agreement is reached, each PM can build her/his own team by picking available resources and start the core translation workflow (i.e., project creation, task assignment, translation, revision, QA). Pro-forma invoicing and fictional payment conclude each translation service.

During the last two months of the project, students have been involved in self-assessing their achieved skills (*SAQ_closure*) to allow pre-post comparisons and in final meetings to activate the *Optimise* DMEMO phase. During the meetings, participants have filled in a SWOT matrix (Gürel, 2017) collaboratively.

4.4 Dynamic Teaming

For this first cycle of STARS, student participation was elective and an online form enabled the application. First-year applicants have been enrolled as translators, while the reviewer role has been assigned to 2nd-year students and the PM role to

2nd-year or graduated students. Teachers have played the roles of platform administrator, language/translation supervisor and fictional clients (Table 1). Participating students have been rewarded with extra-curricular credits weighted by translated/reviewed words and managed projects.

Table 1. Enrollment summary for STARS.

Role	Academic Type/Status	No. of resources
Translator	1st-year MA student	17
Reviewer	2nd-year MA student	11
Project Manager	2nd-year / Graduated MA student	2
Fictional client	Language teacher	1
Platform admin	CAT teacher	1
Supervisors	Language + CAT teacher	2

If compared to other STAs, organised as small teams (less than 10 units) that cooperate or compete against each other (Buysschaert et al., 2017), STARS has been shaped as a unique pool where the PM, for each project, creates her/his own team by reserving resources dynamically, depending on their time availability.

This choice was grounded on dynamic teaming

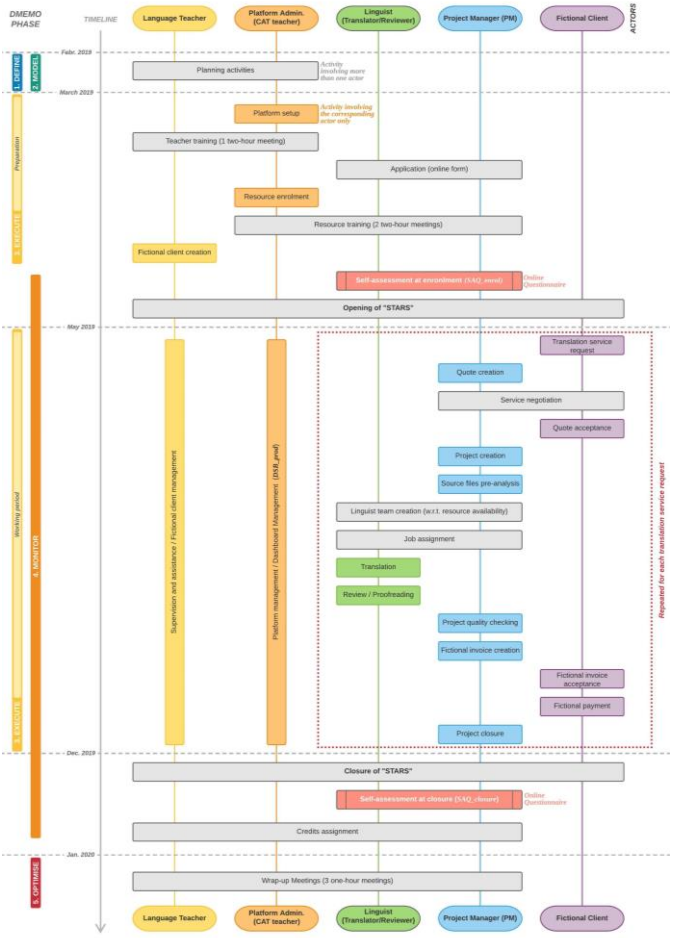
theory (Griffin et al., 2007) in order to improve interaction amongst personnel and to allow PMs experiencing different resource management strategies when multiple translation service requests are received at the same time.

Flexible teams allow complementing traditional interpersonal skills by interpersonal adaptability, which is the set of "*ability, skill, disposition, willingness, and/or motivation to change or fit different tasks, social, and environmental features*" of an individual (Ployhart and Bliese, 2006), thus making her/him capable of adjusting to variable scenarios, demands and requirements. This approach also avoids nurturing excessive competition amongst teams, so that students are encouraged to consider themselves as members of the same innovative activity.

When the STA represents the first opportunity for students to partake in a skills-lab, fostering the group identity rather than team competition is fundamental in order to tackle potential hindrances to the agency effectiveness.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

Figure 3. Time-referenced, DMEMO-based, procedural pipeline for STARS.



Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

5. VALIDATION AND DISCUSSION

5.1 Pre-/Post-STA student self-assessment

Enrolled students have been required to self-assess their skills at the enrolment and at the conclusion of STARS. A 13-question survey dealing with all EMT's competence areas has been used (European Commission, 2018). Participants were allowed to answer according to a 5-point Likert scale (*Very good, Good, Neutral, Poor, Very poor*) so that the items in this Likert battery can be grouped by perception category as *positive* (*Very good, Good*), *neutral* and *negative* (*Poor, Very poor*). Table 2 enlists questions, their competence area and ID.

A comparison between enrolment (pre) and closure (post) self-assessment by perception category has been carried out. When comparing pre vs post Likert scales, several analysis and visualisation alternatives are available: in this scenario, the percentage of answers belonging to a given perception category collected for each question during the two surveys has been considered.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

Table 2. Enrolment (pre) and closure (post) self-assessment questionnaires.

Competence Area	Q.ID	Question
Language	Q01sa	Evaluate your overall language competence.
Translation: overall aspects	Q02sa	Evaluate your overall translation competence.
Translation: editing of source texts	Q03sa	Evaluate your ability to edit source texts.
Translation: editing of target texts	Q04sa	Evaluate your ability to edit target texts.
IT: general tools	Q05sa	Evaluate your IT skills with office & productivity management tools.
IT: CAT tools	Q06sa	Evaluate your IT skills with CAT tools.
Personal: stress management	Q07sa	Evaluate your capacity to manage stress.
Personal: deadlines, instructions, specifications	Q08sa	Evaluate your ability to comply with deadlines and to understand instructions/specifications.
Personal: workload	Q09sa	Evaluate your capacity to manage workloads.
Interpersonal: teamwork	Q10sa	Evaluate your aptitude to work in team (both on site and remotely).
Service provision: interaction with clients	Q11sa	Evaluate your capacity to interact with clients.
Service provision: requirement elicitation	Q12sa	Evaluate your ability to interpret client's requests and objectives.
Service provision: service term negotiation	Q13sa	Evaluate your capacity to negotiate tariffs, deadlines and job specifications with the client.

Each question is depicted as a slopegraph, because this chart type allows comparing two or more quantities over time with respect to several variables (Evergreen, 2019) with higher interpretive

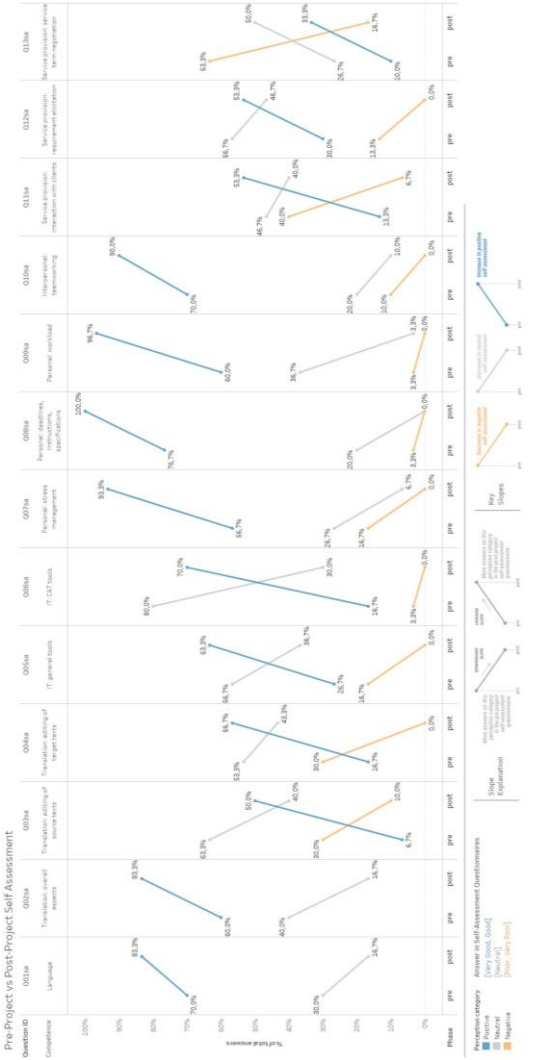
effectiveness than bar charts (Jones, 2019). In a slopegraph, a straight line associated to a given quantity and having a given slope connects a data point at time t to a subsequent data point in time ($t+\Delta t$) describing the same quantity. An upward (respectively, downward) slope shows when one quantity has increased (respectively, decreased) and at what rate this change has occurred.

In this analysis (Figure 4), slopes are charted by perception category for each survey question, while the two time references are represented by the enrolment (pre) and closure (post) self-assessment survey, respectively. The decision to plot only perception categories instead of all available answer options is twofold: first, the resulting overall chart is more readable because fewer slopes per question are used (i.e., three instead of five slopes per question); second, perception categories allow summarising self-assessment outcomes more clearly.

Figure 4 provides several insights. The most evident is that positive perceptions (blue lines) have increased with a noticeable upward slope for all questions. Similarly, negative perceptions (orange lines) have decreased significantly for all questions.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

Figure 4. Pre-vs-post self-assessment comparison (cumulative slopegraph).



Neutral perceptions (grey lines) have decreased evidently for all questions except for Q13sa. This indicates that respondents assessed systematically a clear improvement in their skills after the project experience. Moreover, in eight questions (i.e., from Q04sa to Q10sa; Q12sa) initial negative perceptions were zeroed after this experience, thus demonstrating a strong confidence of students in self-assessing an improvement for those skills. In all questions except for Q13sa, positive perception at the end of STARS was higher than negative and neutral perceptions for the same question.

More specifically, the following outcomes have emerged on a per-question analysis of students' responses. Language (Q01sa) and translation (Q02sa) skills did not present negative perceptions even at enrolment, since students were already confident of their capabilities, but the project contributed to raise their confidence further. The acquaintance with general IT (Q05sa) and CAT tools (Q06sa) has improved significantly: for CAT tools, in particular, the skew between neutral and positive perceptions has been reversed considerably. Personal and interpersonal skills (from Q07sa to Q10sa) have shown the highest improvement in self-assessment, thus revealing a strong confidence in

students about these skills, with a full 100% positive perception about managing deadlines, instructions and specifications (Q08sa). Service provisioning skills, instead, present higher values of neutral perception since involved resources (i.e., PMs and, marginally, reviewers) were fewer. As a confirmation, service term negotiation (Q13sa) scored the highest subset of neutral answers. Nonetheless, even in this case, negative perceptions diminished consistently, since not only PMs improved their negotiation capability with fictional clients but also because they made team members aware that if deadlines and commitments are managed responsibly, more favourable service conditions can be negotiated.

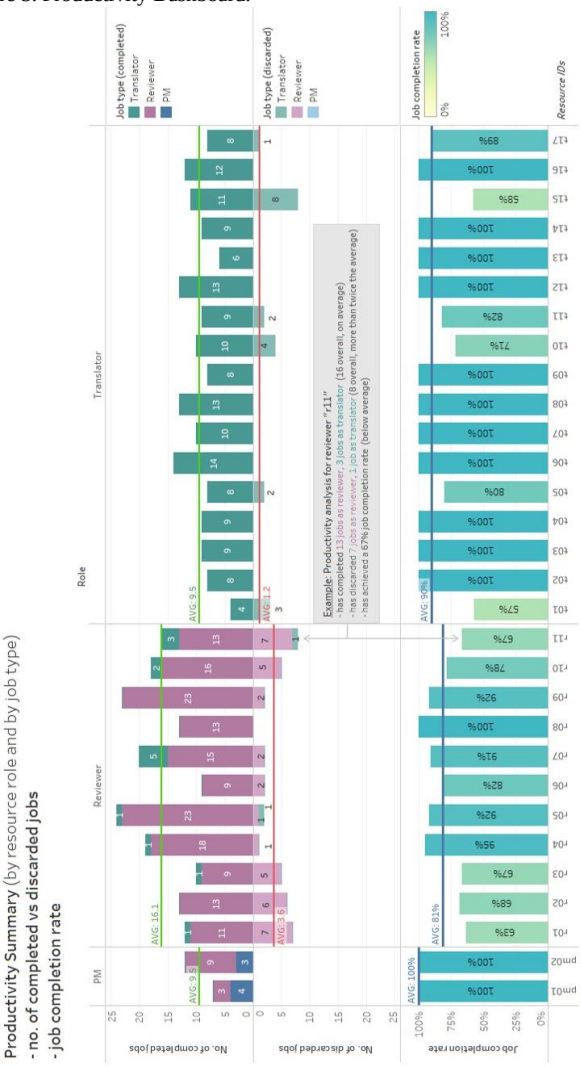
5.2 STA productivity assessment by teachers

In order to allow teachers assessing the agency's status during the *Execution* and *Monitor* phases (Subsection 3.2.2), two dedicated dashboards about productivity and distribution of jobs amongst students have been created. The dashboards are fed by Google spreadsheets filled in by PMs. Time filtering is also available within the dashboards but this Section deals with the overall agency duration only.

The productivity dashboard is reported in Figure 5. It embeds three different vertical bar charts that share the same horizontal axis and have each one a dedicated vertical axis. Resources are anonymised (IDs are shown at the bottom) and grouped by role (top section of the chart). Each vertical bar represents a resource. The upper bar chart shows completed jobs, while the central bar chart depicts discarded jobs.

In order to ease their comparison, the central vertical axis is inverted, thus shaping the combination of these two charts as a butterfly chart (Wexler et al., 2017). Vertical bars are stacked depending on the job type, thus making possible to examine whether a resource having a certain role has managed additional job types. A reference line for average values is reported, per role, for both completed and discarded jobs in order to spot immediately who is working above/below average. The third chart shows the percentage ratio of completed over assigned jobs. Reference average lines are reported for each role, too. An explanatory tooltip (i.e., the grey box), has been added to Figure 5 to guide the reader.

Figure 5. Productivity Dashboard.



Several insights come from this dashboard. First, it shows that PMs and reviewers have managed additional job types (revision for PMs and translation for reviewers) in order to comply with agreed deadlines on specific batches of jobs when available resources were not enough.

While PMs managed to complete all additional tasks, the highest number of discarded jobs comes from reviewers, thus indicating that more resources in that role are needed. The rather demanding workload on reviewers is confirmed by their tendency to discard revision jobs instead of additional translation jobs, thus hinting an interest to job diversification, too.

The majority of translators completed all assigned jobs. Reference average lines for completed jobs highlight that the majority of translators and only a half of the reviewers are on average. Moreover, two reviewers (*r05* and *r09*) show a considerably higher number of assigned jobs. This suggests that the distribution of revision jobs performed by PMs was not so efficient. As for the job completion rate, all roles exhibited significant achievements on this specific metric, demonstrated by high average values.

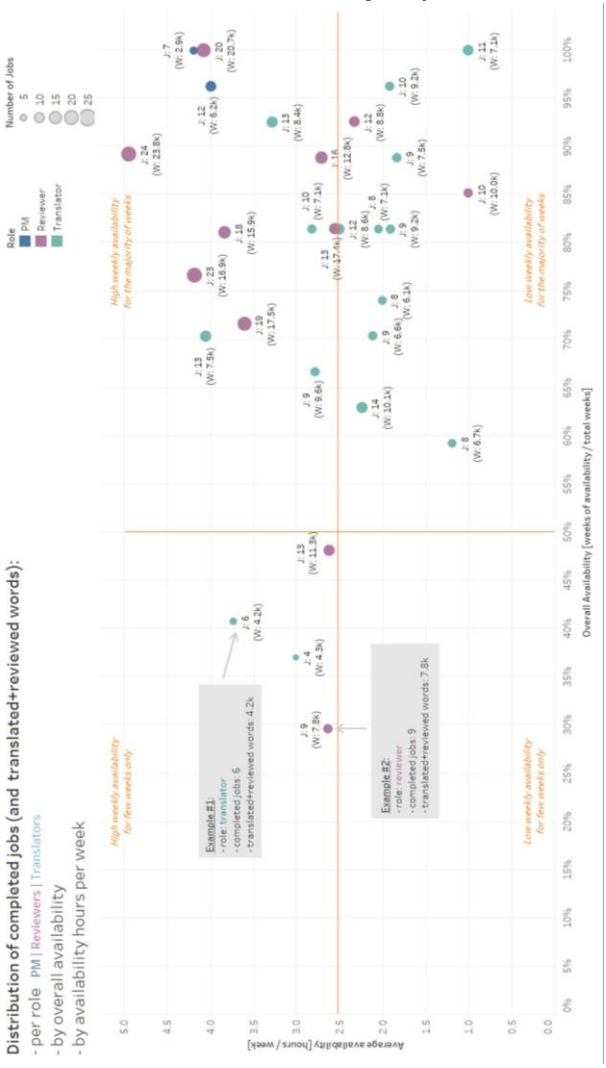
The second dashboard (Figure 6) analyses the distribution of completed jobs by means of a scatterplot (Wexler et al., 2017). In a scatterplot, values are displayed as patterns of points/shapes depending on several variables (e.g., Cartesian axes, shape, colour) so that multiple correlations amongst them can be identified.

In Figure 6, the vertical axis shows the average weekly availability of resources (as hours per week) and the horizontal axis shows overall availability during the *Execution* phase, as a percentage. Each circular shape represents a resource, coloured according to the assigned role. The circle diameter is directly proportional to the number of jobs completed by that resource. The chart has four quadrants, to facilitate clustering the points. Each data point is labelled with the number of jobs (J) and words (W) completed by the corresponding resource. Two explanatory tooltips (i.e., the grey boxes), have been added to Figure 6 in order to ease its interpretation.

The chart allows to spot where completed jobs concentrate the most, depending on resource availability.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

Figure 6. Dashboard about distribution of completed jobs.



First, none of the resources has provided low weekly availability for few weeks only (bottom left quadrant). Second, the majority of resources offered a significant overall availability (top right quadrant), thus indicating a clear success of the initiative. Third, reviewers and PMs have offered a higher weekly availability than translators as blue (i.e., PMs) and purple (i.e., reviewers) markers are clustered in the top right quadrant while green data points (i.e., translators) are clustered in the bottom right quadrant.

The scatterplot-enabled quadrant analysis, therefore, provides rapid and multidimensional productivity assessment and it enables to tune the intervention on resource availability management during the *Optimise* stage.

6. CONCLUSIONS

Fostered by the technology-driven translation industry as well as by several competence frameworks in translation teaching, Simulated Translation Agencies (STAs) have emerged as a valid, holistic pedagogical approach in the recent years. In this paper, a design methodology for cloud-

based STAs has been proposed. The approach is grounded on the DMEMO cycle (widely used in BPM theory) and implements dynamic teaming. The European Master's in Translation Competence Framework and the ISO 17100:2015 standard have been adopted as theoretical references. A set of metrics to evaluate the agency effectiveness and productivity has been introduced, too. The approach has been instantiated as a STA (named STARS) involving 30 MA students in technical translation in an Italian university. Pre-/post student self-assessment and productivity analyses have been performed according to the proposed metrics: the achieved outcomes demonstrate the educational effectiveness of such an approach as well as the considerable student participation rate.

ACKNOWLEDGEMENT

The author wishes to thank Prof. Francesca Bianchi from University of Salento (Dept. of Humanities) for her invaluable support, helpful advice and endless suggestions during this research work.

Zappatore, M. (2020). Lifecycle Design and Effectiveness Evaluation for Simulated Translation Agencies. *Current Trends in Translation Teaching and Learning E*, 7, 118-166. 10.51287/cttl_e_2020_5_marco_zappatore.pdf

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