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Proposing VSM as a tool to compare synchronic online teaching and face-to-face teaching

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Abstract. The C19 forces university teachers to turn into the digital world in a short time. Although online teaching has been proven to be a successful approach for learning, the rapid change that we were subjected to make did not leave space for each of us to assess the impact of this change on the student. All that we knew was: We have to teach online. There is no other possible way right now! However, is it ok to teach online?

Many educators had already faced this question and provided answers for it from different perspectives. However, the C19 did not give time to find answers. We needed to teach online from scratch, and we had little time to learn technologies and prepare or adapt the lessons online.

Nevertheless, after a year of online teaching, there has been time to learn technologies and prepare online lessons. In addition, each of us can collect our data to compare both learning approaches from personal perspectives.

Thus, this aims to purpose the Value Stream Mapping (VSM) as a lecturer tool to assess the educational process from the lecturer's perspective in both synchronic situations (online vs. face-to-face).

The paper explains VSM as a lecturer's self-assessment tool implementing an example in a specific teaching process. This process belongs to the teaching activities of the author. Therefore, the paper avoids generalizing possible answers to the research question. However, further research will require the results from the implemented tool to obtain a sufficient data set for generalizations.

Keywords: Lean Management, Teaching Process, Process Value Added.

1 Introduction

Social distancing restrictions due to the pandemic directly affect the way classes have to be taught (Obrad, 2020). When the C19 hits our reality, not just university teachers had to turn into the digital world in a short time (Watermeyer, Crick, Knight, & Goodall, 2021). Online teaching has been proven to be a successful approach for learning besides some certain obstacles (Sun, Tsai, Finger, Chen, & Yeh, 2008). However, the rapid change in the teaching method that had to be done did not leave space to evaluate the impact of this change from the perspective of the student, teachers, courses, technology, design, and the environment (Sun, Tsai, Finger, Chen, & Yeh, 2008). All that we knew was: We have to teach online. There is no other possible way right now!

As expected, educators and no educators raise questions about the efficacy or validity of the provided education (Obrad, 2020). Or, in simple words, is it ok to teach online? Many educators had already faced this question and provided answers for it from different perspectives such as course environment, students' outcomes & characteristics, and institutional together with the organizational factors (Tallent-Runnels, et al., 2006). The phenomena of Web 2.0 provide new perspectives on student participation and creativity, and online identity formation (Greenhow, Robelia, & Hughes, 2009). The assessment is an online environment that requires formative feedback from the lecturer (Gikandi, Morrow, & Davis, 2011). Furthermore, massive open online courses (MOOCs) have been proven to be a good alternative for learning (Liyaganawardena, Adams, & Williams, 2013). The relationship between the student and teacher also provides insights into the learning process quality (Tormey, 2021).

However, in the framework of C19, there was no time to dedicate to find answers to this question. We needed to teach online from scratch, and we had little time to learn technologies and prepare or adapt the lessons to these platforms (Watermeyer, Crick, Knight, & Goodall, 2021).

Nevertheless, after a year of online teaching, there has been time to learn technologies and prepare online lessons, and there has been at least one entire semester of synchronic online teaching as a replacement for face-to-face teaching. Therefore, each of us can collect our data to compare both learning approaches from personal perspectives. But how about the Value for the student? Does synchronic online teaching provide the exact Value to students as face-to-face teaching?

2 Teaching Process as a Value Stream

The value stream mapping (VSM) is a strong Lean Management tool to understand how the process flows and creates Value (Abdulmalek & Rajgopal, 2007). The VSM tool has implementations in manufacturing and services (Sundar, Balaji, & SatheeshKumar, 2014), including education. For example, the tool has been implemented to improve academic curriculum creation (Zighan & EL-Qasem, 2021) or to develop strategies to reduce work stress in primary education. Thus, the VSM is a versatile tool with a framework to improve a process or assess the Value and other variables.

The development of the VSM requires an understanding of the activities that provides Value to the customer. Therefore, it is necessary to determine the customer and the output of the teaching process. Teaching is a complex set of knowledge transfer activities involving at least one teacher and one student (Eshchar & Fragaszy, 2015). Since the teacher provides the transfer, it is possible to determine the student as the customer of this knowledge transaction. Thus, the output of the process of teaching is the acquired knowledge by the student.

The long list of activities related to the teaching process includes setting learning goals, preparing for conferences and seminars, determining case studies, searching for teaching materials, and many more (Eshchar & Fragaszy, 2015). From the Lean/VSM perspective, it is necessary to determine the source of Value in the process. In this case, these are the activities that create Value for the customer (student). Nevertheless, it is

also necessary to determine the activities that are not providing Value. Some of these non-value activities are necessary to develop the process, and others are entirely waste (Chowdhury, Shahriar, Hossen, & Mahmud, 2016).

The source of Value in an e-learning course is among the teaching activities within six dimensions: Student, teachers, courses, technology, design, and environment (Sun, Tsai, Finger, Chen, & Yeh, 2008). From this perspective, the main factors influencing the Value in the process are the student computer anxiety, the teacher attitude toward e-Learning, e-Learning course flexibility, e-Learning course quality, perceived usefulness, perceived ease of use, and diversity in assessments (Sun, Tsai, Finger, Chen, & Yeh, 2008). A different set of factors influencing teaching courses online are course environment, students' outcomes, students' characteristics, and institutional factors and organizational factors (Tallent-Runnels, et al., 2006). In both cases, the value activities are related to the students acquiring knowledge, mainly happening at the sessions in synchronic teaching. While it is understood that asynchronous communication tends to facilitate deeper communication, it is not much more than in traditional classes (Tallent-Runnels, et al., 2006). Therefore, the means of communication through which the sessions are held is necessary but not decisive. Thus, the online teaching process factors are related to the technological possibilities rather than the knowledge transfer itself (Eshchar & Fragaszy, 2015; Tallent-Runnels, et al., 2006).

3 Methodology

This paper approaches the comparison of synchronic online teaching and face-to-face teaching implementing the Value Stream Mapping (VSM) and Lean principles. Despite the multiple research approaches implemented to assess distance education, this paper explores the VSM possibilities as a personal tool to assess the educational process from the lecturer's perspective in both synchronic situations (online vs. face-to-face). Therefore, this paper proposes a self-assessment tool for teaching processes using Value as the assessment parameter.

The first step is to determine the process in which the tool will be implemented. Then, it is necessary to determine the activities that provide Value, and finally, it is necessary to calculate the Value of these activities as a percentage of their time divided by the total time of the process (Chowdhury, Shahriar, Hossen, & Mahmud, 2016).

The chosen process is a "5S Methodology training". It is a four-hour learning activity with lecturing and workshops for twelve participants. One training was delivered in October 2019 before the C19 and as face-to-face training in a classroom. The training participants are employees from different manufacturer organizations related to quality, manufacturing, warehouse, and other similar activities. The second training was delivered on January 2021, in the middle of the lockdown due to C19. Thus, it was delivered online for workers of the same company related to similar quality, manufacturing, warehouse, and others. This specific training allows the comparison since both teaching experiences have a similar number of people, similar profile of participants, similar positive assessment and it is promoted by the same organization. The mentioned training assessment is performed by the same organization as a feedback and continues

improvement strategy. Thus, the learning outcome is fulfilled similarly, and the only significant change is the obligation to do the training online due to the pandemic lockdown. The implementation of the SIPOC tool helps to illustrate the process.

The implementation of the activities diagram tool facilitates listing the process activities and their classification as Value or non-value activity. This tool has a list of activities, the typology of activities (Operation, Transport, Checking, Delay, Storage), the time of each activity, the distance (if needed), and the number of workers developing the activity (Greasley, 2013). First, the value-added (VA) activities are identified, and their times are selected as VA time. Then, the other activities are identified as non-value-added activities (NonVA). This permits the calculation of the percentage of the VA in the process in both situations (synchronic online vs. face-to-face). Then, the graphical representation of both VSMs displays the processes to determine comparison.

Additionally, the lists of times represent a set of time data of the process. Thus, the implementation of the 2-Sample t Test of the Mean and the 2-Sample Standard Deviation Test provide insights to determine the comparison of both trainings.

4 Findings

The chosen process to illustrate the implementation of the tool is a “5S Methodology training”. The synchronic online (Synch) version and the face-to-face (F-T-F) version of the training can be summarized in the same SIPOC diagram.

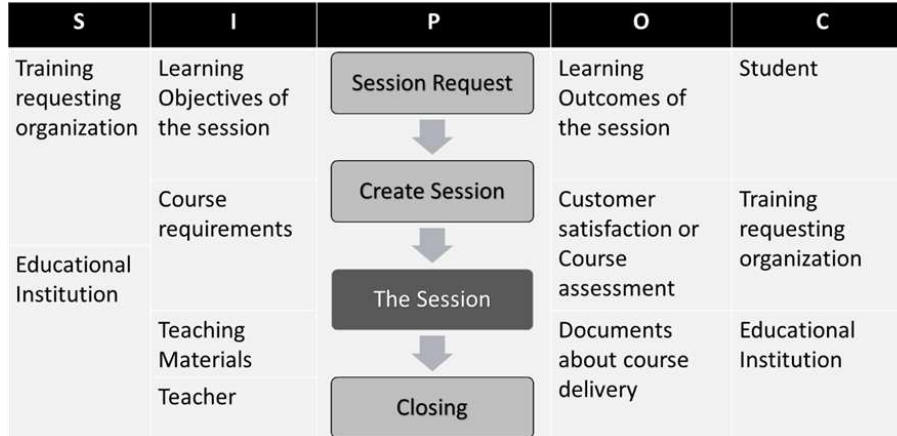


Fig. 1. SIPOC - The teaching process of a specific training

The four-hour training is similar in both situations since the only change is the environment where the educational process takes place. The activities before the start of the training are the same in both situations. Also, the activities after the end of the training are the same. These activities include conversations via email or telephone, sending documents, and evaluations. From the customer's point of view (student), the session is

the only source of change between both trainings. Thus, the VA time is only 240 minutes.

The implementation of the activity diagram of the face-to-face (F-T-F) training shows that there are activities before the session such as understanding of the session requirements, determining the session flow, the workshops, etc. The assumption is that the teacher prepares the session two weeks before the session starts. In addition, the F-T-F training has the specifics of transportation. In this case, the transportation shows the distance from the University to the training site. Also, there is the preparation of the classroom before the session and bringing the materials for the workshops.

Table 1. Process activities F-T-F and Synchronic

VSM	Face To Face (F-T-F)				Synchronic online (Synch)			
	No.	Activity	Time (min)	Distance (Meters)	No.	Activity	Time (min)	Distance (Meters)
A	1	Receive the requirement	5		1	Receive the requirement	5	
	2	Understand the learning objectives	60		2	Understand the learning objectives	60	
B	3	Determine the session flow	30		3	Determine the session flow	30	
	4	Determine the workshops	60		4	Determine the workshops	180	
	5	Ask for the materials for the workshops	60		5	Ask for software or apps for the workshops	60	
	6	Create the presentation	60		6	Create the presentation	180	
	7	Send the preparation to students	20		7	Send the preparation to students	20	
C	8	Waiting for the session date	19200		8	Waiting for the session date	19200	
	9	Commute to the session	30	2300	9	Commute to the session	0	0
	10	Prepare the session classroom	10		10	Prepare the session classroom	10	
	11	Bring the materials	10	15	11	Bring the materials	0	0
	12	The session	240		12	The session	240	
D	13	Clean the classroom	5		16	<i>Wait for the feedback</i>	240	-
	14	Pick lecturers' stuff	5		13	Clean the classroom	0	
	15	Go to the office	30	2300	14	Pick lecturers' stuff	5	
	16	<i>Wait for the feedback</i>	960	-	15	Go to the office	0	0
	17	Lessons learned	30		17	Lessons learned	30	
	Total		20815	4615	Total		20260	0

After the session, the activities are cleaning and organizing the classroom before leaving. Also, the transportation to return to the office at the University is included. Finally, the time required to obtain the course's feedback to develop the lessons learned for subsequent sessions.

The activity diagram of the synchronic online (Synch) version of the training shows that the time creating the session's slides is longer since the lectures and workshops have to be more frequent to have a better relationship between the student and teacher (Tormey, 2021). The difference in this preparation time is observed in the 88-slide (34MB) presentation of the Synch training compared to the 22-slide (5MB) presentation of the F-T-F training. Likewise, the number of workshops in Synch training is more significant, and therefore the time to prepare them increases. Activity number five has the same time but changes its objective. Since the session is online, then materials for workshops are changed by platforms for teaching. The most significant change in the Synch training is the absence of transportation. The lecturer does not require to commute to the training site. Thus, all the transportation activities have null time and distance.

Similarly, the activities after the Synch session related to transportation or classroom have null time and distance. Moreover, the activity waiting for feedback is happening faster and right after the end of the session. Since everything is online, students deliver their assessment of the course immediately or at least the same day, while in the F-T-F version, it might take up to two days if they are doing online or even longer for paper-based assessments.

The consolidation of the activities in a four-step VSM shows that the F-T-F training has 500 minutes of value-added activities, 20315 minutes of non-value activities, and a VA% of 2,4%.

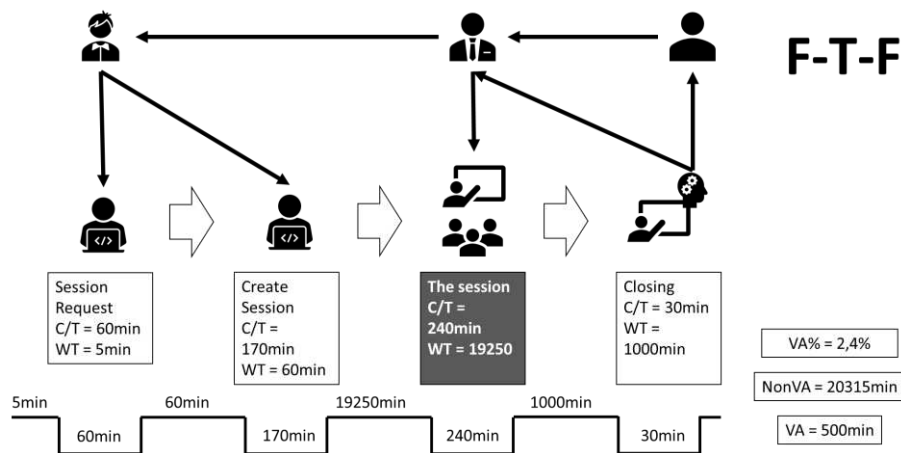


Fig. 2. VSM of the F-T-F teaching process

The Synch training the VSM illustrates a higher VA time of 740 minutes, a lower Non-VA of 19510 minutes, and a higher VA% of 3,65%.

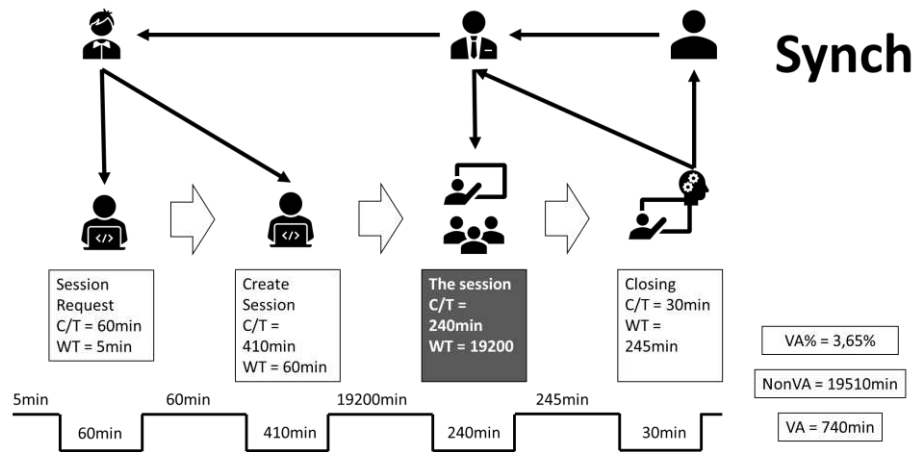


Fig. 3. VSM of the Synch teaching process

The additional analysis of the 2-Sample t Test of the Mean of Synch and F-T-F determine that the means of both data sets do not differ ($P=0,673$). Similarly, the 2-Sample Standard Deviation Test for Synch and F-T-F reveals that the standard deviation of both data sets does not differ ($P=0,654$).

5 Discussion

There are some important differences between the two teaching processes presented. First, the list of activities for the Synch training is lower than F-T-F by three activities (Activities 9, 11, and 15). These are the activities related to transportation, which loses their sense within this process because there is no transportation on the Synch training. Then, the fifth activity changes its purpose since physical materials are not required, but platforms, software, and applications are required to develop the workshops online but synchronously. Also, the flow of the process changes with activity 16 since this is related to the session's feedback, which in the online session can be done almost immediately. However, these differences are not necessarily averse to the process since both online, and face-to-face have constraints, consequences, and success factors (Obrad, 2020; Eshchar & Fragaszy, 2015; Tallent-Runnels, et al., 2006).

The exploration of the value-added times and non-value-added times in both processes reveals that the differences are relatively small. The F-T-F process is longer than Synch, has less VA time, more NonVA time, so then less VA% in comparison with the Synch process. Thus, from this VA perspective, synchronous online teaching is better than face-to-face teaching. However, the factors that influence the learning experience are broader (Eshchar & Fragaszy, 2015; Sun, Tsai, Finger, Chen, & Yeh, 2008; Tallent-Runnels, et al., 2006). Thus, this paper exposes the teaching experiences rather than the

learning experience. The teaching preparation for the online sessions requires different and more preparation than the face-to-face sessions. While in the classroom, the teacher-student interaction flows during the session allowing the teacher to navigate the content and activities within a prepared framework; at the online session, the lecturing and workshops must be detailed designed on specific timing to guarantee good teacher-student interaction (Tormey, 2021). Then, the time saved in transfers and transportation is required to develop a much more interactive session, with more short workshops and fewer long lectures.

The VA analysis takes the preparation of the classes as valuable time. However, from a strict perspective of the concept of Value towards the student, there are only 240 minutes that the student is learning with the teacher or the session time. In this case, the VA% for F-T-F is 1,15%, while the Synch is 1,18%. This confirms that the difference between both processes is relatively small. Additionally, the results of the 2-Sample t Test of the Mean and the 2-Sample Standard Deviation Test provide more evidence to argue that the difference between both processes is minor.

The similarity of both trainings allows the presented comparison. This similarity also includes the positive assessment of both trainings. Thus, the outputs from both processes are similar. Moreover, further research should investigate the impact of the changes within the 240minutes session taking in consideration that the customer of a training has less chance to take the same course twice. Thus, the improvements based on the current customer's feedback will be applied to a different customer and therefore the new feedback is not coming from the same customer (Eshchar & Fragaszy, 2015; Gikandi, Morrow, & Davis, 2011). Nevertheless, the teaching/learning process effectiveness during these 4 hours session requires an in-dept analysis for further discussions.

The effectiveness of the VSM in representing and evaluating the educational processes has been well described in the literature (Zighan & EL-Qasem, 2021; Sundar, Balaji, & SatheeshKumar, 2014; Abdulmalek & Rajgopal, 2007). Furthermore, this paper also implements SIPOC as a tool to determine the scope of the process in this analysis. However, there are other tools that might be considered for the development of a similar analysis. This paper implements VSM since the tool provides information about the value flow, but tools such as flowchart might provide insights on sequential or parallel activities as well as other interactions (Damelio, 2011).

6 Conclusion

The VSM has proven again that it is an excellent tool to assess the Value of any process (Zighan & EL-Qasem, 2021; Sundar, Balaji, & SatheeshKumar, 2014; Abdulmalek & Rajgopal, 2007). In this case, the VSM helps compare the teaching process of a face-to-face session and an online synchronic session. Listing the activities performed by the teacher with the time to develop them allows the teacher to develop a simple basic assessment of the effort to develop the session and the provided Value to the student. Although some activities change their flow or composition, the idea is to keep the VA of the process as similar as possible.

Moreover, the VA analysis of the teaching process collects insights from the teacher's perspective rather than the learning experience. Education is much more complex than the teacher's effort to provide knowledge by delivering a session. Nevertheless, the teacher needs to review how the VA of the entire process changes due to the change of the teaching means. This paper shows the comparison of one specific training delivered both online and face-to-face. The analysis of the VA change from both processes provides the teacher with insights on how these teaching methods change the VA provided to the students. By following the teaching process assessment principles of this comparison, the teacher can create a self-assessment tool to verify the change in the provided VA.

The implementation of the VA analysis of the teaching process using the VSM perspective requires further research. However, it is expected that other teachers implement the tool to enhance its characteristics and usability.

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