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Managerial Control in an Online Constructivist Learning Environment: A Teacher's Perspective

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Abstract: This article presents the lessons learned from an online teaching experience in the field of managerial control. The study aims to identify the determinants which influence collaborative behaviors between students in management studies and more specifically during the construction of performance measures. A business simulation specifically elaborated for this study is used. The study is conducted through a particular research design consisting of an online learning environment built on constructivist learning principles. The learning environment simulates the different steps of a performance dashboard creation (a set of performance indicators) for a fictitious organization. The study adopts an exploratory sequential design to explore and examine social behaviors during the process of knowledge construction related to performance measures. It contributes to a better understanding of the role of cognitive and behavioral skills in the profession of management accounting and how teachers can incorporate such aspects into their courses. It helps to build awareness among educators about the benefits of using digital learning solutions to help students in accounting and managerial control develop their professional skills most effectively.

Keywords: management accounting; performance measures; constructivist learning; socio-cognitive indicators; managerial control; teaching environment

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1. Introduction

The business environment is seen as a complex system, with, on the one hand, more uncertainty, and, on the other, a greater flow of information, which impacts the skills managers need to master [1] and the way to teach them [2]. Managerial control and accounting are central aspects of the manager's activities [3]. Those activities are increasingly becoming "social activities" where the ability to work in teams, use online tools, and communicate decisions are becoming central aspects. We designed a virtual (online) learning environment to better train students in managerial control. In this environment, students must establish performance measures, learn managerial control, use their social skills to converse with team members, and communicate their performance measures to various stakeholders.

The approach adopted in the study can be qualified as 'explanatory' according to the framework proposed by Pfister et al. [4] to distinguish between different levels of theoretical abstraction in managerial control research. The explanatory level is used to explain control phenomena and develop an explanatory focus in the research design, which requires a narrow assessment of causal explanations between variables.

Our study aim is to examine the individual psychological factors which influence the social behaviors of participants when they are engaged in the knowledge construction of a set of organizational performance measures or 'performance dashboard'. To be able to create performance measures, participants need to complete a series of activities where

they interact and cooperate inside and between different groups. In this process, participants will encounter socio-cognitive conflicts, for example when interacting with each other or with their external environment, or when receiving new information or data. They will need to respond to those socio-cognitive conflicts, which they may respond to in different ways to resolve cognitive dissonance. To be able to examine social behaviors, the researchers need to create a virtual scenario that simulates the process of knowledge construction of performance measures in a business organization, along with a virtual learning environment that recreates the social context of a typical consultancy project for key performance indicators where participants need to be immersed. This is made possible by using a Virtual Constructivism-Based Learning Environment (VCLE) in a Learning Management System (LMS).

Including those approaches to managerial control, we may respond to the growing concerns that traditional theory on managerial control systems may not be able to embrace the more dynamic and complex view needed in the contemporary context [4,5]. For this we employ a constructivist approach.

Constructivism epistemology has gained growing recognition in management accounting education, as management accounting professionals consider social skills and cognitive abilities of management accountants as critical to adapt a complex working environment and the increasing role of data analytics technology. Jakobsen et al. (2019) argued that the constructivism approach to learning can help develop accounting students' ability to act as business partners in business organizations and advocated for constructivism-based learning as an alternative pedagogical paradigm for teaching management accounting [6].

This paper retraces the theoretical background leading to the building of such a learning experience (Section 2), the development of a research design to monitor the impact of the student's skills (Section 3), first results as well as the impact of this learning environment (Section 4), and the lessons learned for teachers and researchers who have the desire to develop such an exercise on their own for their students (Section 5).

2. Literature Review

Scholars in the field of management accounting have called for more interdisciplinary research studies combining, among others, psychology theory and management accounting models to better understand the social and cognitive dimensions in the construction of Managerial Control Systems (MCS). Birnberg et al. (2006) have reviewed psychological theories that have proven useful in management accounting research, including cognitive, motivational, and motivational social psychology theories [7].

Hall (2016) recommended the use of psychology theory to develop stronger linkages between individual and organizational-level studies in management accounting research [8]. His view is that psychology theory may allow for a better investigation of the theoretical linkages between management accounting and psychological processes in a more dynamic perspective than the traditional research approach. After conducting a review of prior research in contingency-based management accounting using psychology theory, Hall (2016) concluded that more focus on the individual level combined with dynamic perspectives is necessary for further theoretical developments in management accounting research. According to Hall (2016, p. 66),

> "*A prominent feature of organizational-level studies is the lack of explicit attempts to theorize the psychological processes through which management accounting practices are expected to influence individual behavior and, in turn, how individual behavior is expected to combine to influence organizational-level outcomes such as organizational performance*".

Management accounting research focusing on rationality in social action has contributed to significant theoretical developments in the contingency theory of MCS. Broadbent and Laughlin [9] argued that MCS lies on a continuum between two alternative models,

either 'transactional' or 'relational' types, representing individuals' dominant behavioral orientations or preferences in an organization towards MCS. In a similar approach, Townley et al. [10] had already argued that performance measurement should integrate two dimensions of rationalization: communicative rationality, on one hand, being the pursuit of reason in human affairs which brings to light the justifications by which actions and policies are pursued, and rationalization on the other hand, which represents the cognitive dimension of instrumental rationality to specify the means and ends of organizational actions and activities. The combination of 'interplay' of those two dimensions constitutes an important factor to be able to effectively construct an MCS in an organization.

Seal and Mattimoe (2017) attempted to apply the concept of sensemaking to managerial control and concluded that, in terms of the production of management control knowledge, pragmatic constructivism and sensemaking have several overlaps and complementarities [11].

Those authors show the need for interdisciplinary research. In the following, we underline the possibilities offered by incorporating psychological factors with managerial control (Section 2.1), the socio-cognitive conflicts that arise during decision-making (Section 2.2), and the implication of those results on our learning environment design.

2.1. Psychological Factors in Managerial Control Systems and Constructivist Learning

There exists a very active field of research aiming to investigate psychological factors in constructivist learning about collaborative learning [8].

Several studies have focused on metacognition and individuals' epistemic beliefs to examine the psychological factors that influence learners' behaviors in constructivist learning environments. Metacognition has emerged as one of the most prominent constructs in cognitive and educational psychology. Hartman (2001) defines metacognition as cognition about cognition or thinking about one's thinking, including both the processes and the products [12]. McCabe (2011) suggested that training in applied learning and memory topics has the potential to improve the cognitive judgments of students [13]. Barger et al. (2018) investigated the mechanisms of personal epistemology development in the constructivist learning environment in a chemistry class and found that students' epistemology can change over time when exposed to constructivist learning environments: students' learning performance increases when their beliefs match the course structure [14]. Students' beliefs about knowledge and their epistemologies are most likely to deeply affect the learning climate and perceptions of the complexity of the constructivist learning environment [14]. Moreover, epistemic climate, defined as the amalgam of students' behaviors and beliefs, the instructor's behaviors have a major influence on learners' behaviors in a constructivist learning environment. Consequently, it is increasingly recognized that educators should address the role of epistemic beliefs to prepare students to learn in a constructivist learning environment.

Several other studies have focused on learners' attitudes towards the use of technology in learning, or the impact of organizational and individual factors that influence the acceptance of virtual learning environments among students [15–18]. Yueh et al. (2015) investigated the factors affecting students' adaptation and continued use of a Wiki system for collaborative writing tasks and found that factors of social influence have direct and significant effects on students' actual usage of the Wiki system [19]. While investigating learners' intentions toward virtual reality learning they found that perceived self-efficacy can positively affect perceived ease of use, perceived usefulness, and learning motivations. It could be that feelings of competence and experience toward technology may help learners to overcome challenges when dealing with new technologies [18].

2.2. Socio-Cognitive Conflicts

Socio-cognitive conflicts have emerged as a very active field of research to better understand the benefits of online learning environments to increase learning performance

[20]. Socio-cognitive conflicts are defined as discrepancies of knowledge experienced by learners in the process of knowledge construction which may come from interaction with the external environment [21]. Those conflicts occur within a group when a learner is confronted with different ideas and conceptions that other group members embrace. By bringing together students with different perspectives or ideas on the same problem, learners face contradictions in their perspectives, thereby experiencing socio-cognitive conflicts. Socio-cognitive conflicts focus on cases in which contradictory views exist between learners in the course of their interactions. There is also evidence from online interactions that learners confront and face up to cognitive dissonance when experiencing socio-cognitive conflicts through their online interactions with others.

Educational psychologists have claimed that socio-cognitive conflicts are essential in constructivist learning environments because those environments should emphasize the role of context in learning, social interaction, and inter-communication as part of the process of knowledge construction among learners. However, even if cognitive development and socio-cognitive conflicts have been recognized as playing a critical role in constructivist learning, most studies attempting to demonstrate the relationship between socio-cognitive conflicts and the effectiveness of collaborative learning have produced mixed results. There are several conditions for socio-cognitive conflicts to effectively contribute to constructivist-based and collaborative learning. This may include individual factors and physiological or psychological factors, apart from external factors such as environmental factors or instructional design. It is commonly recognized that the mindset of learners is comparatively more influenced by the environment in constructivist learning than in the context of traditional learning. Environmental factors influencing the mindset of learners may come from learners' attributes as well as the use of technology [22,23].

Several studies have focused on the specific discourse patterns through which learners interact in groups when they face socio-cognitive conflicts [20,22]. From that point of view, it is critical to examine the quality of group processes through students' interactions to understand the effect of socio-cognitive conflict on collaborative learning outcomes. Buchs and Butera (2004) showed that students' confrontations during peer learning can be beneficial to learning performance when working on complementary information. Several scholars have attempted to theorize those socio-cognitive processes to help analyze interactions between learners, which may include a variety of methods, such as conversational analysis or using coding schemes [24]. Strobach and Karbach (2016) provided an overview of socio-cognitive and socio-affective processes which includes numerous components to investigate how social skills can be trained [25]. They proposed a model to better understand the regulation of socio-cognitive conflicts and the factors influencing the outcomes of socio-cognitive conflicts in social interactions, arguing that those factors depend on different meanings that individuals involved in the interaction process between two persons may have on the meaning of the socio-cognitive conflict. This may include attitudes to disagreement, acceptance of being right or wrong, and feelings of self-inferiority.

The need to examine socio-cognitive processes via analyzing learners' interactions has gained more and more recognition to better understand the effect of socio-cognitive conflict on cognitive development and learning. Several authors proposed similar typologies of socio-cognitive styles to help analyze behaviors in response to socio-cognitive conflicts which contain five main categories: avoiding, forcing (which is contrasted with competing or dominating), compromising, accommodating, and collaborating [26–28]. Collaborating socio-cognitive style is the only style in which the learner embraces the cognitive conflict when one tries to work together with another to find a solution that satisfies the needs of everyone concerned.

The socio-cognitive style is associated with sharing of ideas, and examination of differences to reach a view acceptable to various parties. In addition, Zhan et al. (2021) proposed to distinguish between different conversational functional moves to help analyze participants' interactions when encountering socio-cognitive conflicts. Functional moves

include sharing, eliciting, elaborating, clarifying, extending, exploring, qualifying, and synthesizing [28]. Overall, the lack of theoretical background on socio-cognitive processes may remain an issue, because of the lack of instruments used to analyze interactions between learners and the difficulty of measuring a comprehensive range of effects on collaborative learning outcomes. Despite those difficulties, it should be noted that socio-cognitive conflicts could provide new theoretical perspectives in management accounting research.

Based on those recent findings we developed a business case where students must construct various performance measures to be able to properly manage a company. They must develop those measures in teams and communicate them to stakeholders. To ensure socio-cognitive conflicts arise in the teams, several 'events' or scenarios unfold during the management of the virtual company. The students, therefore, adopt the mentioned strategies (collaborating, communicating, etc.). The next section presents the learning environment in more detail.

To follow those requirements, exploratory research was conducted in an online learning environment aiming to provide solutions to educators to enhance the skill development of learners as well as social interactions in a virtual setting. To develop a model, the study was carried out through two consecutive case studies, reflecting the experience and reaction of the teaching team. In a case study Alpha, the main objective was to explore a configuration of diverse influences and social behavior along the different steps of the student's learning process. This phase contributed to developing research constructs, defining several variables, and examining the relationships between variables. The model developed in the case study Alpha was further revised. In a second case study (Beta), the model is tested through scenario-based experiments using similar research setting and design as in case study Alpha. Section 3 of this paper describes the model and research questions.

In the case study Alpha, the level of analysis was mostly focused on the participant's social behaviors when taking part in the knowledge construction process across a range of several learning activities; the unit of analysis was primarily the individuals, but some analysis may also be carried out at the group-level or whole population (organizational) level to investigate phenomena and research constructs. In the case study Beta, the unit of analysis was the individuals only, and variables were measured on a contingent basis in time-boxed activities where participants were expected to display some behavioral intentions in the context of typical situations or scenarios encountered. Those target behaviors define how participants want to react to alternative possible paths of action depending on their likeliness to display collaborative social behaviors as their intentions in terms of rationality in social action [9].

The literature review we undertook showed a strong need to make changes in the teaching of managerial control and accounting, in order to better prepare the student for the new economic reality. However, we found a lack of tools incorporating socio-cognitive conflicts [20,21,24,29]. Therefore, we developed a specific learning environment (Section 3). We offer feedback on our first results (Section 4) and pinpoint some suggestions for teachers who would like to develop similar tools in their courses.

3. Methodology: Creating a Learning Environment

3.1. MPP Our Virtual Company

The first phase of the study (case study Alpha) was conducted at an international university in China during the completion of one online course entitled 'Data Analytics and Business Strategy', which was delivered during the period from September to October 2021 for postgraduate students. Twelve students were enrolled in this course coming from different majors (finance, accounting, and business analytics) and the course lasted for a total period of five weeks. The second phase of the study (case study Beta) was conducted in an online course during the period November–December 2021 using a similar

course design and VCLE, but with a different population of students. For this course, twenty-one students were enrolled, and the course lasted for a total period of three weeks.

In both case studies, students were assigned to groups of three to four students (called 'Project Teams') and required to create a performance dashboard for a virtual company called MPP. The preparation of the performance dashboard involves several project steps, including (1) proposing strategic objectives which performance indicators will help to monitor; (2) construing performance indicators to monitor performance against strategic objectives; (3) presenting visuals of the performance dashboard (set of performance indicators) using a data analytics software.

The course was designed based on a problem-based learning approach, which means that each group ('Project Team') had to define its own approach to the business problem in the virtual business scenario and accommodate its learning path to be able to complete the three phases as indicated above. Lectures and seminars were mainly focused on introducing concepts related to creative business models, digitalization, strategic management accounting, and performance measurement while students had to complete a majority of semi-self-driven learning activities with limited assistance from the teacher. Students could enter and complete learning activities online through a unique interface created in the LMS (see Figure 1). Those learning activities aimed to encourage collaborative behavior and social interaction in the preparation of the performance dashboard such as virtual rooms, social forums, and synchronous or asynchronous forum discussions. Meanwhile, several activities were planned to provide regular subjective feedback to help them monitor their progress along the learning process. At different times, participants were answerable for the timely completion of activities, including decisions on strategic objectives, the choice of performance indicators, and using the functionalities of the data analytics software to visualize, manipulate, and share data information and visuals.

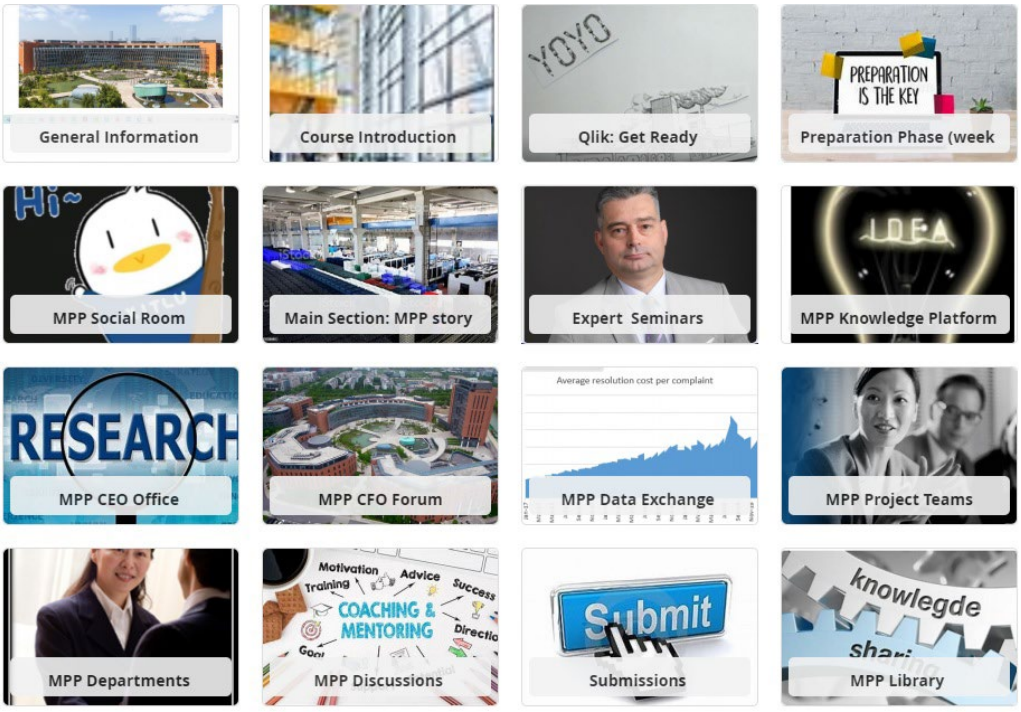

Figure 1. Learning Environment Interface.

Through the Learning Environment Interface, students are immersed in a VCLE which creates the conditions for socio-cognitive conflicts to occur along the different steps of completion of the learning process and allow learners to resolve those conflicts through

a collection of primary and secondary data, sharing of information, but also through social interactions between learners in the same group ('Project Teams') and through interactions between different groups from the Project Teams. To adequately propose a performance dashboard, students needed to integrate different perspectives which aimed to foster group cognition. Socio-cognitive conflicts result from interactions in which individuals reorganize and restructure their respective points of view to advance in their cognitive development by discussing their ideas. Participants were expected to gather data during the preparation of their performance dashboard. As primary data are not available in the public domain, participants needed to interact with other participants or virtual roles in the learning environment to submit and process data requests through different mechanisms and social learning activities embedded in the learning environment. As such, the learning environment could be seen as a learning ecosystem, viewed as a collection of roles, processes, and tools that deliver, integrate, and support the learning experience.

The course included preparation activities aiming to help students adapt to learning methods in a constructivist learning environment. The preparation phase was comprised of a series of individual asynchronous learning activities (pre-recorded lectures, individual assignments, and peer reviews). Participants were provided with case materials at the beginning of the course as well as guidelines about course objectives, structure, and users' instructions about the virtual learning environment.

3.2. Research Design

In the case study Alpha, the study comprised three consecutive rounds of data collection and analysis which took place in each of the three phases of the preparation of the performance dashboard by students, as explained above. After the completion of each round, research questions were revised and the model was refined accordingly, based on new findings and meta-inferences identified after the completion of each round.

Figure 2 provides more details about the instruments of data collection used. The analysis of the datasets informs the researcher about meaningful patterns and trends in the social behavior of the participants, as well as the potential causal factors that could explain the occurrence of those behaviors. This allows the researchers to refine instruments of data collection. In the next step, we reproduced the course, this time with more emphasis put on communication and social interaction between participants. Finally, data results were integrated along with triangulation of quantitative and qualitative data analysis and interpretation of the results and reviewed to refine research questions about the relationships between psychological constructs and the social behavior of participants. The findings were synthesized and recorded in the form of memos after the completion of each round.

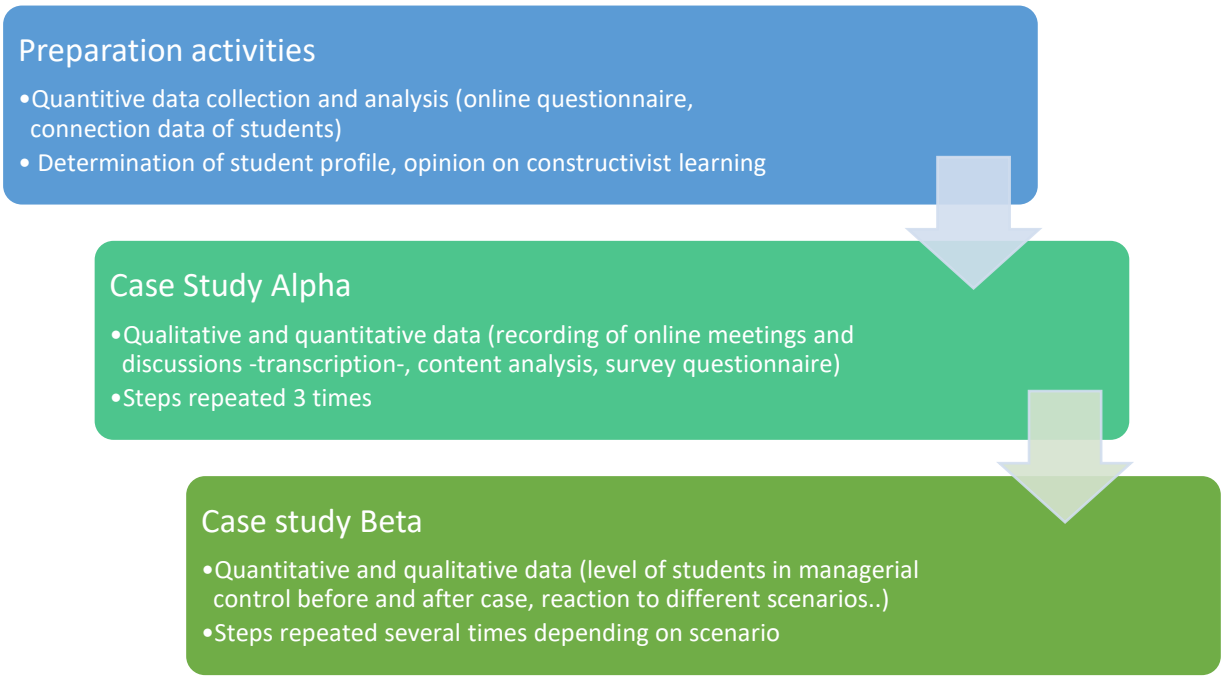

Figure 2. Research Design—Case Study Alpha and Beta.

In the case of study Beta, we followed a scenario-based approach where different events were put in place to push the reaction of students (sharp decrease in sales, increase of interest rate, new competition, problems with stakeholders). We measured the behavioral intentions of students at different steps (e.g., engaging in more discussions, collecting more information and data, reformulating the strategic objectives). Students had to choose how to react (adapt or not) to their measures and strategy. Before and after case Beta, questionnaires were used to measure participants' attitudes, beliefs, intentions, and degree of literacy towards the learning environment and knowledge related to managerial control.

3.3. Main Assumptions—Case Study Alpha

At the beginning of the study, several preliminary assumptions were developed based on the main findings from existing literature about the psychological factors influencing social behaviors in both fields of managerial control theory and collaborative learning in educational research studies, as well as from previous experience of the researcher. Exploration of research constructs started by focusing on main broad categories of psychological factors including, for example, individual epistemic beliefs towards constructivist learning, perception of the effectiveness of the learning activities, literacy in learning instructions and guidelines, awareness of employability, and lifelong learning.

To evaluate the social behavior of participants, a composite index variable based on the frequency of the occurrence of certain types of social behavior in the process of knowledge construction of performance measures has been introduced. Those types of social behaviors are defined based on socio-cognitive styles and functional moves in response to socio-cognitive conflicts. As participants encountered a series of socio-cognitive conflicts due to the differences in knowledge, conceptualization, or discrepancies of information or data available to the participants in the learning process, they were encouraged to adopt collaborative types of social behaviors to achieve the learning outcomes. Firstly, the researcher needed to distinguish between socio-cognitive conflicts originating from a lack of primary data and socio-cognitive conflicts originating from other forms of discrepancies in knowledge. The researcher could then focus, in particular, on social behaviors displayed by participants along the various stages of cognitive development (or the resolution of cognitive dissonance) during the completion of those learning activities which

were intended to help participants to resolve socio-cognitive conflicts originating from a lack of primary data. This approach allows the researcher to measure the extent to which participants demonstrate collaborative behavior in the process of knowledge construction of performance measures.

The study drew on several assumptions to suggest the main components and variables of a model to be tested through quantitative analysis: (1) learners who have more positive epistemic beliefs towards constructivist learning are more likely to engage in collaborative-type behaviors in the process of knowledge construction of performance measures; (2) learners who achieve a higher level of literacy in the course instructions and guidelines are more likely to engage in collaborative-type behaviors in the process of knowledge construction of performance measures; (3) learners who have more positive perception of the effectiveness of learning activities in helping them to achieve learning outcomes are more likely to engage in collaborative-type behaviors in the process of knowledge construction of performance measures; (4) learners who show a higher degree of awareness towards employability and lifelong learning to engage into collaborative-type of behaviors in the process of knowledge construction of performance measures. Those assumptions were developed at the same time as research constructs were explored along with the construction of both independent and dependent composite variables to be able to measure those constructs and test the relationship between them. In the model, independent variables measure psychological constructs and dependent variables relate to the 'collaborative behavior propensity index' related variables as explained. Table 1 provides a summary of the different constructs and types of variables investigated in the case study Alpha.

Table 1. List of Constructs and Variables—Case Study Alpha.

Factors	Research Constructs
Epistemic Beliefs (rounds 1/2/3)	• Individual (personal beliefs) towards constructivism • Complexity/real-world environment • Role of teacher • Self-regulation of learning (including learning from others) • Employability
Perception of Effectiveness of Learning Activities (rounds 1/2/3)	• Perception of the effectiveness of learning activities • Cognitive Activities • Communication Activities • Data Exchange
Learning Culture (rounds 2/3)	• Perception • Shared • Expected/reinforced • Rewarded
Level of Literacy towards Course Instructions (round 3 only)	• Level of literacy
Adaptation to the constructivist learning environment (round 3 only)	• Level of adaptation
Social Behavior	• Collaborative behavior propensity index'

3.4. Main Assumptions—Case Study Beta

The psychological constructs of the model to be tested in case study Beta were derived from the research constructs explored in case study Alpha. In cases where research constructs identified in the case study Alpha could not be included in the revised model as psychological constructs, those constructs were then considered as potential antecedents to psychological factors such as, for example, the level of literacy towards the course instructions aiming to explain to participants on how to complete learning activities and use the different functions in the online learning environment.

The revised models contain three categories of independent variables which reflect the most significant psychological constructs evidenced in the case study Alpha, with some adjustments in the definition of the psychological construct and underlying composite variable used to measure those constructs. Behavioral intentions were categorized into four main types depending on the type of learning activities and target behaviors based on each typical scenario, which represents critical steps in the knowledge construction process of performance measures. This follows the usual methodology requirements for implementation of the research model, where target behavior should be defined carefully in terms of target, action, context, and time.

Several research questions about relations between psychological constructs and collaborative-type behavioral intentions can be tested, among them the three relations below, which were paid more careful attention by the researchers based on preliminary results of a brief review of field qualitative data available, as well as the main insights from observations of the participants.

Research question #1: *participants who think that discussing with other members of their team to make plans on how to deal with data limitations is useful for the preparation of their performance dashboard are more likely to adopt collaborative-type social behaviors in interacting with other participants along the process of knowledge construction of performance measures.*

Research question #2: *participants who think that the learning experience using a constructivist learning environment is useful for them to develop the skills expected by recruiters after graduation are more likely to adopt collaborative-type social behaviors in interacting with other participants along the process of knowledge construction of performance measures.*

Research question #3: *participants who think that the amount of time allocated to complete tasks in the learning activities is not sufficient are less likely to adopt collaborative-type of social behaviors in interacting with other participants along the process of knowledge construction of performance measures.*

3.5. Procedure

3.5.1. Case Study Alpha

All participants' conversations in online learning activities were recorded and transcribed into English text for coding and content analysis (lectures, seminars, forum discussions, and online meetings); this also included the recording of conversations between participants and the members of the research teams (called 'feedback discussions'). The coding method used was a standard hand coding that was performed independently by the different researchers involved, following the classical coding recommendation for such activities [30,31]. In addition to real-time, synchronous conversational activities, online conversations in the asynchronous mode were also recorded for coding and content analysis. Once contents were made available, the coding procedure was applied to measure the 'collaborative behavior propensity index' for each participant, which represents the extent to which students demonstrate collaborative types of social behaviors in the process of knowledge construction of performance measures. To ensure consistency

of data, collaborative behaviors were analyzed at two different levels about socio-cognitive conflicts: (1) socio-cognitive conflicts resulting from a shortage of primary data initiated through data requests submitted by participants; (2) other socio-cognitive conflicts which occur from other types of discrepancies of knowledge. By coding social behaviors about each particular data request, the social behaviors of participants can be examined from the origination of the data request and along the different steps of resolution to evaluate the level of collaborative behaviors of participants. Several options were discussed by the students to try to resolve this issue, including (1) discussions between team members to identify to assess the opportunity to source more information and data from public sources; (2) online discussions with participants from other groups, to check whether the information is already available among other participants; (3) interactions with the teachers through online forums. In each of those resolving strategies, social behaviors can be identified and coded. The coding procedure is consistent in identifying the actions taken by participants in subsequent learning activities and codifying their social behaviors when participating in those learning activities that require social interaction with other participants or the teacher.

Several meetings were organized to review intermediary results of data analysis and discuss suggestions for adjustments in the instruments for collection of data, as well as revise the model. Such meetings occurred one or two times but no less than one time in each round of data collection and analysis.

3.5.2. Case Study Beta

The experiment has been conducted in three steps. At each step, all students were asked to complete survey questionnaires online to measure their behavioral intentions and the antecedents' variables to those intentions. Those questionnaires were completed in around ten min at a time right before the start of three specific types of learning activities (virtual meetings) which are critical to the process of construction of performance measures in terms of social interaction. When answering the questionnaires, participants were presented with short scenarios and asked to indicate how they would prefer to respond to the scene in terms of how they would prefer to interact with other participants. Those short scenarios replicated the same situations and context that participants would encounter in the learning activity that took place just right after answering the questionnaire, to make sure that their responses are consistent with the whole context in which students are immersed.

In the next step, students from the experimental group had to attend a special workshop where the teacher provided more information to participants about the rationale of the learning approach and methods used in the course. This workshop was supposed to help students reflect on their learning experience and understand the reasons and benefits of engaging in the learning activities collaboratively.

The data collected from the questionnaires were then compiled into a database for statistical analysis in Excel software (Microsoft Corporation, Redmond, WA, USA).

4. Results

4.1. Case Study Alpha

In the case of study Alpha, participants' beliefs towards constructivism were measured through survey questionnaires. Preliminary findings from triangulation of data showed that even students demonstrating strong positive beliefs towards constructivism in general did not always display collaborative types of behaviors when participating in learning activities, emphasizing social interaction between participants. Moreover, it was found that, despite having positive beliefs toward constructivism, most participants did not have a very good understanding of the instructional guidelines for the course, which was negatively affecting their engagement in learning activities. More questions were

added up in the survey questionnaires to help measure participants' level of literacy towards the learning environment created for the course. However, no clear evidence could be established to provide enough justification for the relationship between the level of literacy towards the instructions and guidelines provided to the students and collaborative behaviors from statistical analysis, while results from content analysis of qualitative data revealed that this was the case for a few participants.

Several concerns were raised during the conduct of the study about participants' perception of the learning climate and their perception of the operational effectiveness of the learning environment. Although several elements in the review of qualitative data alerted the researchers that this could represent a significant factor influencing participants' social behaviors, no clear evidence could be established to provide enough justification for the relationship between the perception of the learning climate and collaborative behaviors.

4.2. Case Study Beta

The results from quantitative analysis confirm that awareness of employability and lifelong learning has a positive influence on participants' level of literacy in the learning environment. The results show that participants who had undertaken the workshop activity achieved a higher level of literacy after attending the workshop, as compared to other participants. The results indicate that the level of literacy of participants improved in the final test after attending the workshop. Although not relative to social behaviors as such, those results confirm the positive effect of awareness of employability on participants' level of literacy, which could be viewed as an antecedent to social norms or individual beliefs in the model investigated in the study.

Despite some insightful results, the size of the sample population under study in both case studies Alpha and Beta remains an issue that could not be overcome by the researcher's efforts in the triangulation of quantitative and qualitative data. One major difficulty in the study was being able to isolate psychological factors from other internal or external factors influencing social behaviors, such as individual motivations of participants, or cultural factors. Several factors may affect the social behavior of participants which are not directly addressed in this exploratory study: notably, factors relative to the visual used or the attire of the instructors [32]. Collaborative behavior is affected by the quality of instructional design, or proper use of technology, as well as time constraints even if great care was taken to minimize the effects of those 'polluting' elements. Other contingent noncontrollable factors, for example the availability of participants to attend critical learning activities, may also pose an issue.

5. Discussion and Lessons Learned

5.1. Discussion

We believe that the main outcome of the study is to provide a research framework that can help solve some of the methodological issues faced by interdisciplinary research in management accounting combined with psychological theory. Beyond the model investigated and despite several issues in testing the validity of the model, the research strategy, design, and methods developed in the study can serve as a basis for further qualitative field research studies in managerial control contingency theory. The research strategy and design take advantage of recent technological and theoretical developments in the field of digital learning to create a learning environment that immerses learners into a context where cognition and social behaviors in the construction of performance measures can be properly examined from a dynamic perspective.

Despite limitations in scope and availability of quantitative data, which makes most results from statical analysis uncertain, the study provides useful insights to help better understand the relationships between psychological factors and social behaviors in the design or performance measures from a dynamic perspective. As a most significant insight resulting from the data analysis, awareness of employability is evidenced as a major

factor that influences the social behaviors of learners in knowledge construction of performance measures. Additionally, the study brings reasonable evidence that students showing a higher degree of literacy in the constructivist learning environment are more likely to engage in collaborative behaviors in the knowledge construction process of performance measures. Another valuable insight from the study is to show that when learners do not understand the outcomes and benefits of the learning environment and activities then it becomes unlikely that they will engage in social interactions. Learners who can make sense of the constructivist learning environment are more likely to engage in collaborative behaviors, as they better understand the rewards of collaboratively participating in learning activities that can help achieve learning outcomes and enrich their learning experience.

5.2. Lessons Learned and Insight for Teachers

Many of the criticisms addressed to education in the field of management and more specifically to managerial control mention that classes, tests, analytical methods, models, and analyses utterly fail to prepare students for managing in the real world of complex, wicked problems. Courses that focus solely on analysis, procedures, and tools must be placed in the framework of the enterprise in its social context. According to several of the complaints cited above, students are not adequately prepared for managerial control in the real world of complex or wicked problems through coursework, assessments, analytical methods, models, and analyses.

Therefore, many teachers in managerial control have started, like us, to develop tools and cases that mimic as much as possible the complexity of the real world. The reality is that such programs need more time and personal effort to create, organize, and teach than conventional executive MBA, master's, or even bachelor's education programs. Building or adapting a case into a learning environment requires more time from professors and can be challenging for highly specialized, research-oriented teachers who are required to publish academic journals in parallel.

For professors who are accustomed to lecturing or who feel the need to be in charge of teaching (as opposed to learning, which is a student's responsibility), using active learning and facilitation-oriented pedagogies can be challenging. Our study showed that a huge amount of preparation is needed, especially to perfectly master all technical issues of the online learning environment. This comes in addition to the traditional time devoted to mastering the case of the company presented and the time needed to prepare the knowledge and concept relative to the field studied.

Despite these barriers, we are convinced that there is a desire among many faculty members to engage students more fully. When it comes to orientation, education, and disciplinary competence, highly specialized, discipline-based professors may occasionally find it challenging to see students as participants and as co-creators of the learning environment.

Inviting business speakers from a very varied spectrum of backgrounds or colleagues from other disciplines is also a way to underline the importance of the course to the students.

It is clear to us, after this preliminary study, that we had an excessive focus on methodologies and analysis of the behaviors of the students. We aim to monitor everything by recording all online and transcripts may not be so much needed. The most useful approach is a face-to-face discussion after the course with the students in small groups.

We also noticed that the first sessions of the exercise have been difficult for the students and the teachers. Students have a problem facing all of the many facets of business today. Combining these factors makes integrative skills, systems thinking, a wide view of business, and a diversity of viewpoints increasingly crucial to long-term managerial success. Our findings suggest that educators should pay attention to providing more guidance to students and detailed instructions which can help enhance collaborative behaviors.

Finally, we have to take into account that managerial control is not a uniform course that can be taught in the same way everywhere [33]. As a professional skill, managerial control supposes that the manager collects information, aggregate them into performance measures, and takes decisions based on them. However, some cultures, such as the Chinese culture, have a habit of seeing a situation as research for equilibrium [34,35]. Therefore, focusing on a limited number of indicators may seem difficult for some students, as well as deciding without sufficient information. However, some universities are developing their own teaching philosophy to overcome such limitations [36–39].

A natural next step would be to test the virtual learning environment with a larger number of students from different nationalities. To improve the impact on learning we would use a less complex research design and aim for a very limited number of indicators to monitor the performance of the students.

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