DESIGN STUDENTS MEET INDUSTRY PLAYERS: FEEDBACK AND CREATIVITY IN COMMUNITIES OF PRACTICE

Abstract

This work investigates the social collaboration and creative outcomes of teams of learners in Higher Education (HE) Design studies, in the context of cross-organizational (university/industry) Communities of Practice (CoP). These refer to groups of people who share a common interest in a field and connect to co-create knowledge. The study focuses on the feedback delivered by the industrial members of the CoP using technology, with findings indicating a twofold effect on learners. On the one hand, critical feedback on the deliverables increased both the time-pressure and the complexity of the work, affecting the teams' perception of their performances. On the other, feedback appeared to inspire better creative outcomes while improving the teams' metacognitive activity and learning regulation. Furthermore, it enabled learners to pragmatically realize their status within the broader geography of professional practice and reconfigure their achievement goals accordingly. These indicate sound self-awareness and vocational relevance and confirm the contribution of cross-organizational CoPs in HE.

Keywords: Communities of practice, feedback, creativity, collaboration, design education

1. Introduction

Basic academic knowledge aside, creativity, collaboration skills and vocational relevance are key qualities required of graduates transitioning into today's creative digital industries (Binkley et al., 2012; Botma et al., 2015; Edmondson et al., 2012; Onsman, 2016). By digital creative industries, we refer to the convergence of the fields of design, programming, interactive media and business (Proctor-Thomson, 2013). *Creativity* is presently the cause of much movement in educational research, as it is crucial not only in the arts, but also in seemingly disparate areas such as the domains of science and engineering (Crilly & Cardoso, 2017; Cropley, 2015; Oh et al., 2013). Creativity nevertheless remains particularly important in the digital creative industries that are intrinsically associated with innovation (Wijngaarden et al., 2019). Creative and innovative outcomes aim for both novelty and appropriateness for real-world problems; this makes *authenticity* a crucial factor in all creative activity (Amabile, 1982). Authenticity, from a learning perspective, involves the assignment of ill-defined problems in interdisciplinary settings, active ties and collaboration professionals and experts in the field and—crucially—industry-driven criteria and feedback to guide the ensuing work (Grohs et al., 2018; Herrington, 2009; Lombardi, 2007). Social collaboration competencies are also crucial for authenticity in learning, especially in the digital creative domains, where teamwork is essential (Becker et al., 2017; Leung & Bentley, 2017; Nguyen et al., 2016). Higher education (HE) is nevertheless falling behind in producing social creative thinkers who have real-world experience and feel confident to collectively drive innovative performances in the professional domain (Edmondson et al., 2012; Mourshed et al., 2013). A key cause appears to be the lack of dialogue between academia and industry, a combination that can effectively inform and enhance programs in achieving desired outcomes (Roodhouse, 2009). Students placed in decontextualized learning settings that are isolated from real-world practice report a lack of motivation to engage in creative collaboration and problem-solving (De Graaf & Kolmos, 2003; Herrington et al., 2004; Leung & Bentley, 2017).

One response to these problems originates from *situated learning*, a theory which supports that knowledge cannot materialize out of the context— be it conceptual, social, technical or professional—it is meant to apply to (Brown et al., 1989). Communities of Practice (CoPs), a model originating from the same theory, suggest that groups of people can collectively create knowledge and competency as *socially situated* members of a common practice in a particular domain (Lave & Wenger, 1999; E. Wenger, 1998). In the same vein,

we propose that collaboration and creativity in learner teams can be bolstered through social participation in real-world industry-academia (cross-organizational) CoPs. We base this on what we currently know through existing research on the positive contribution of CoPs in learning (deChambeau, 2017; Fegan, 2017; J. Y. Park, 2015; Pharo et al., 2014; Power & Armstrong, 2017; Tight, 2015). As the majority of the abovementioned work takes an intra-organizational approach (i.e. by focusing only on education), what we currently lack is research on the CoP-mediated role of industry in education, and the effects of this interaction on learning. There is also much scope to analyze the learning phenomena that occur within CoPs in a specific discipline (Smith et al., 2017).

This work reports on the collaboration processes and outcomes of HE students as participants in cross-organizational CoPs in the field of design. The study takes place in a blended learning setting, therefore the role of technology is deemed crucial for both *team-based* and more importantly, *community-wide* collaboration, as it can help bypass the geographical and temporal obstacles posed by the heterogeneity in the CoP membership (academic and industrial members). By recruiting two groups of learners—an experimental and a control group— the study first aims to compare the CoP's impact on the creative outcomes of students. It then proceeds to analyze the emergent CoP collaboration processes, and more specifically the *feedback*. The purpose of the analysis is thus to understand the nature of the cross-organizational feedback in Design studies and in turn, how it is experienced and processed by learners in the CoP (Cummings et al., 2016; Popescu, 2014). Feedback is significant also due to the fact that it's strongly associated with the practice of design and related disciplines (i.e. architecture, engineering, technology), where critiquing and reviewing is fundamental in the development of creative works (Adams et al., 2016; Huet et al., 2007). This study is thus guided by the following research questions (RQs):

1. What are the effects of participation in a cross-organizational CoP on the creative *outcomes* of learners?
2. What is the nature of the feedback that typically emerges in cross-organizational CoPs in the field of design and related domains?
3. How is *community-wide collaboration* experienced and processed by the learners in the CoP?

This work aims to form a well-rounded understanding of the collaboration phenomena and resulting outcomes, in respect of feedback. Through its findings, it seeks to contribute useful insight and direction for educators, designers and researchers who wish to implement,

participate in or evaluate the HE cross-organizational CoP model, with a special focus on feedback, for the purposes of enhancing learning and outcomes for students.

The following sections outline important work relating to CoPs, creativity, collaboration and feedback in education. Next, we describe the methods employed in the study and proceed to analyze the various outcomes, triangulating and drawing connections between quantitative and qualitative results. Finally, the key findings are outlined in the discussion and conclusion sections.

2. Literature review

2.1. Communities of Practice (CoPs)

CoPs can emerge organically in any social group sharing a common passion and goals in a given field (Eckert, 2006); alternatively, they can be intentionally designed and maintained by a CoP "steward" (E. Wenger et al., 2009). The steward—mainly associated with virtual CoPs (VCoPs) - is also responsible for tailoring technology to the specific needs of the community (Dolmans et al., 2015).

At its core and drawing from cognitive apprenticeship and situated learning theories, the existence of a CoP presupposes multi-level knowledge and skills (ranging from novice to expert) from its members, who interact to strengthen their competencies and attain their goals within a domain (Vaughan & Dornan, 2014; E. Wenger et al., 2002). Learning can occur through a process termed as Legitimate Peripheral Participation (LPP), which involves varying levels of social participation (from full to partial), observation and imitation of more competent others (Brown et al., 1989; Fegan, 2017; E. Wenger, 1998). A CoP's main constituents include a joint enterprise (common goal), mutual engagement (motivation and participation) and a shared repertoire (i.e. vocabulary, resources and methods that are gradually developed overtime) amongst its members.

As indicated by research, CoPs can play a key role in learning: they encourage socially mediated learning through pragmatic knowledge networks (Allee, 2000; Gunawardena et al., 2009; Hildreth & Kimble, 2004; Schønheyder & Nordby, 2018), they facilitate peer assessment and reflection (Rourke & Coleman, 2009) and they provide valuable support for novices through LPP (Johnston, 2016; Stone et al., 2017; Woo, 2015) across educational, industrial and governmental sectors (Bate & Robert, 2002; Khalid & Strange, 2016; Pattinson & Preece, 2014; Tight, 2015).

Technology-supported or virtual CoPs (Nistor & Fischer, 2012) have also been widely adopted over the past two decades. VCoPs make use of configurations that accommodate certain CoP activities by bundling different platforms and software tools (Khalid & Strange, 2016; E. Wenger, 2009). By transcending space and time and often moderating cultural limitations, technology is an ideal means by which remote members of a cross-organizational CoP can collaborate.

2.2. Creativity

Guildford's (1967) contribution to creativity research was key in aiming to provide a concrete definition (Batey, 2012; Kurtzberg & Amabile, 2001; Shneiderman, 2000). He stated that creativity is the sum of sub-constructs, namely, *originality*, *fluency*, *cognition* & *memory*, *flexibility* and *sensitivity to problems*. More contemporary designations of creativity widely refer to the individuals or the process that lead to products that are appropriate for a purpose (Amabile, 1982; Furnham et al., 2011; Kaufman & Baer, 2005; Mumford, 2003; Runco & Okuda, 1988; Sternberg & Lubart, 1999).

Following an exhaustive, large-scale review of twenty-first century creativity literature, that was deemed as important by creativity researchers and theorists, Hennessey and Amabile (2010, p. 572) inferred that creativity research was fragmented, one of the reasons being the isolation of the multiple creativity sub-fields under investigation and the respective theoretical stances, methodological approaches and questions asked (Glăveanu, 2014). Nonetheless, they concluded that there was a degree of agreement in the definition of creativity with respect to two components, namely, *novelty* and *value* (or *appropriateness*). They specifically suggested that "creativity involves the development of a novel product, idea, or solution to a problem that is of value to the individual and/or the larger social group".

Theorists apprehending the multi-dimensionality of the construct and focusing on the processes that can nurture creativity, posit that contextual affordances (physical, digital, social) are crucial in all creative activity; hence their relationships warrants a reformulated approach in the investigation of creativity (P. B. Paulus & Nijstad, 2003; Plucker et al., 2004; Rhodes, 1990).

With respect to these directions, we focus on *social creativity*, which has received considerable attention over the past decades, as it was found to generate far greater results than the sum of individual creativities (D'souza & Dastmalchi, 2016; Meneely & Portillo, 2005; Sawyer & DeZutter, 2009; Wishart et al., 2011). Within the scope of a

situated approach to learning that can foster creativity, research cannot afford to ignore the social or contextual dimensions of the creative processes and outcomes that ensue (Csikszentmihalyi & Hunter, 2003; Sawyer & DeZutter, 2009).

However, Paulus & Nijstad (2003) noted that while there is common understanding of the importance of such contextual (*social*, *cultural*, *organizational*) aspects of creativity, literature still lacks a systematic approach for the investigation of the processes that link to creativity. Following their review of studies on *group creativity*, they offer four common themes to guide the research efforts in social or distributed creativity. These refer to a) the significance of group *diversity* (functional, informational, cognitive) - versus homogeneity – in the creation of innovation, b) the effort to lower the risks of *motivation* and *coordination* loss in groups so as to augment their creative potential c) the group *climate's* impact (i.e. trustful, critical, restrictive) on inhibiting or fostering the expression of divergent ideas and ensuing activity, and d) the significant interaction between group and *environment* (i.e. social, cultural, organizational), with the latter playing an influential role in the creative processes, as well as a definitive one for the *value* of creativity within a specific scope (social judgement).

Following these lines, Glăveanu's (2014) later contribution in the theoretical expansion of *social* - termed as *distributed* - creativity, was significant, through a dynamic conceptual framework that sees creativity as materializing through the entanglement of *social*, *material* and *temporal* dimensions; the framework thus provides three lines of distribution which reflect these. Primarily the ***social*** aspect of creativity is explained as: *co-creation*, whether explicit (i.e. through collaboration) or implicit (i.e. through the social mark on the tools and resources used, or the so far intellectual contributions of others), as a form of *socially constructed* awareness of others' 'voices', ingrained in the creator's perception, shaping the creation processes and defining the perceived *value* of the creative outcomes produced, as these would be judged by others.

Further, the ***material*** line of distribution, which takes into account the *agency* of objects used or artifacts created, and the overall affordances (i.e. intended ways of use) of the contextual environment, that can play a supportive or resistive role in the creation processes. Finally, the ***temporal*** line of distribution which considers the role of time in the creative process, from a *cultural-historical* perspective (past contributions), the *individual trajectories* (evolution of creativity over the creators' life) and the *micro-temporal* aspect of 'creativity in the making', as the spontaneous run-time processes that allow the micro-creations, changes and adjustments to happen.

The evaluation of creativity has involved a number of different perspectives over the years (Cherry & Latulipe, 2014; Shneiderman et al., 2006). In an aim to capture the different facets of the construct, Batey (2012) proposed a three-dimensional taxonomic analytic framework, to be used following the research objectives. According to this, researchers need to define the *level* (i.e. team, organization, culture or individual), *facet* (i.e. trait, environment, process or outcomes) and decide on the *measurement* that is most efficient in collecting the required data (i.e. objective, self/external rating, subjective).

That said, a prominent amount of work focuses on *individualistic* perspective of creativity, asking the "big" questions ground in the personality traits, dispositions, inclinations, thinking, styles and so on (Crilly & Cardoso, 2017; Gough, 1979; Hennessey, 2017; N. K. Park et al., 2016; Runco, 2007) through behavior, activity-based and other scoring methods such as self-reported psychometric or externally-rated tests (Plucker et al., 2004; Runco et al., 2014; Torrance, 1966). Some of the most prevalent scoring measures include the '*Torrance Test of Creative Thinking*' (TTCT), which comprises figural and verbal testing (Almeida et al. 2008; Kim 2006; Torrance 1966), the '*Kaufman Domains of Creativity Scale'* (K-Docs), a self-reported domain-oriented instrument, (Kaufman, 2006; Kaufman et al., 2009), and '*Runco's Creativity Assessment Battery'* (rCAB)© , that attempts to assess the creative *potential* and creative *performance* dimensions (Neufeld et al., 2017).

However, such tests have faced long-term criticism, based on the inherent difficulty of not being able to define the actual trait being measured (Sawyer, 2011, p. 45); or being prone to errors based on research variations such as gender, culture, or testing administration conditions (K.-H. Kim, 2004; Sawyer, 2011; Swartz, 1988). That said, a considerable amount of research has ensued since their emergence, which employed such tests as part of its investigation of creativity, while also aiming to confirm respective outcomes and prove their predictive validity – as in the case of the TTCT for instance (Plucker, 1999; Runco et al., 2010).

An important note to be made here towards leveraging their role in creativity research, given the suggestions of theorists and researchers in the field, is that their results should be considered partial and should be verified and triangulated against scores from additional tests (K. H. Kim, 2006), or most importantly, combined with and integrated within the scope of interrelated research directions (Glăveanu, 2014; Mayer, 1999, pp. 449–460) that seek to derive more compound inferences on creativity. Likewise, Hennessey (2017) suggests that research has over the past few years been reformulated

to understand creativity more of a *system* in action. According to this, researchers can only rely on the view of creativity as an inseparable *web* of different forces (social, cultural, temporal, psychological) and rather than breaking it down into small manageable and measurable units, this warrants an integrative and multidisciplinary approach to its investigation.

2.3. Feedback in education

Feedback is a primary component of social learning and CoPs (Cummings et al., 2016; Popescu, 2014). It is also strongly associated with processes in design and related areas (HCI, technology, architecture, engineering) where real stakeholder participation, like user feedback, evaluations, expert reviews and studio critiquing are integral elements in the work cycle (Adams et al., 2016; Huet et al., 2007; Østergaard et al., 2018).

Studies have provided evidence on both the positive and negative effects of feedback on learner performance (Boud & Falchikov, 2006; Harks et al., 2014; Knight, 2002; Schartel, 2012). Its role as part of a formative as well as an interventional approach to assessment is critical as it can offer timely guidance, promote reflection and metacognition and lead to higher academic accomplishments (Glăveanu, 2014, p. 88; Miller, 2009; Yorke, 2003). It has also been found to encourage divergent thinking and generative processing (i.e. inter-team stimulation that generates new insights) and in turn, to cultivate creative activity (Hoever et al., 2018).

Feedback can, however, also trigger undesirable effects in learning, particularly when it is expressed negatively. For instance, one study on written feedback (Weaver, 2006) deduced that comments that were predominantly negative were deeply discouraging to university students. Likewise, other work posited that quantitative or competitive feedback in the form of scoring not only posed a negative emotional load on learners, but also hindered their perceived epistemic abilities (Bower, 2005; Tekian et al., 2017). The repercussions of harsh feedback on learners' *self-belief* and *motivation* are well documented in literature (Hyland & Hyland, 2001; Irvine, 2018; Jonsson, 2013; Price et al., 2010). This is expected as evaluators typically tend to overelaborate on the negative points, while "scratching the surface" of the positive ones (Värlander, 2008).

Related work on self-beliefs can guide our understanding of learning phenomena (Ames, 1992; Bandura, 1991; Irvine, 2018). Particularly, two types of self-belief: a) *self-efficacy*, which involves beliefs about one's capabilities and b) *self-concept*, which focuses on the self-appraisal of one's worth as influenced by socio-cultural variables, i.e.

what other people—whose opinions we care about—believe about us (Pajares & Schunk, 2001; Wang & Neihart, 2015).

The interaction between feedback and learner self-beliefs is also present in modern instruction methods. A study by Gormally et al (2009), for example, involved *inquiry* (experimental) versus *traditional* instruction (control) groups in HE. Findings indicated higher gains in content literacy and research skills, but decreased levels of self-confidence for students in the experimental condition. Inquiry-based learning involves ill-structured real-life problems, work-reasoning based on actual case studies and limited guidance from the instructor. In contrast, carefully controlled, traditional learning environments (control) do not include the challenges of dealing with the authentic information and criticism that are often encountered in inquiry learning conditions (experimental). Interestingly, although these hindered students' *self-concept* and *self-confidence*, they still led to overall greater epistemic outcomes (Gehlbach et al., 2008).

Likewise, the importance of a situated approach to feedback (contextualized in real-life scenarios) in HE is highlighted in similar work (Boud & Falchikov, 2006; Harrison et al., 2015). Boud & Falchikov (2006) posited that such contextualized and constructive feedback can be effectively achieved (in self and peer form) through CoPs. Participation in a CoP can help students develop the aptitude to judge their own outcomes based on professional community standards and benchmarks, as opposed to solely academic ones (Gilbuena et al., 2015; Rodgers et al., 2014). Broad CoPs that include stakeholders such as industry experts, clients, prospective employers or government workers can offer much-needed diversity in the practice of feedback, which students can then use to mold their domain-level knowledge and competencies (Albats, 2018; Etzkowitz & Ranga, 2015; Price, 2005).

3. Material and methods

3.1. Participants

The study involved 39 (27 female and 12 male) third-year Multimedia and Graphic Arts undergraduate students (in a four-year course). The students (age range from 21 to 24, M=22,4) were enrolled in a Web Design and Development course (WDD) for a semester (13 weeks x 180-minute-lessons) and were divided—by registration—into two groups (Group1, N=21 and Group 2, N=17). The students put themselves in teams of around four people, totaling about five teams in each group. Both groups had previously

attended identical programs and presented no statistically significant differences in their grades: Group 1 (M = 7,27, SD = ,91) and Group 2 (M = 7,26, SD = ,56), $t(36) = -,07$, p = ,17).

3.2. Research design and procedure

The study employs a mixed-method design, using multiple methods of data collection and analysis, including quasi-experimental design, to compare the creative outcomes of the two groups, and qualitative data to explain and support these. Group 1 formed the experimental and Group 2 the control group. Both groups shared identical curricula and assignments in the course of the study. A total of five authentic projects were assigned by industrial mentors, who were invited to participate as "clients." Each project (essentially, the design and development of a website) was implemented twice: once by a team in the experimental condition and once by a team in the control condition, independently. However, only the experimental group teams a) participated in the CoP and interacted with the industry members and b) used collaborative online tools to support their community-wide collaboration. Teams in the control condition were limited to ordinary university-wide exchanges that took place as part of a traditional curriculum.

3.3. The CoP model and the technology configuration

The CoP was designed and steered by the course instructor (steward), as suggested by the framework for newly formed communities (E. Wenger, 2009). It comprised internal (academic) and external (industrial) stakeholders with diverse knowledge and experience in the field of design (see Figure 1). These were: a) the *instructor* of the course, b) the *floating facilitator*, i.e. a graduate student working as a TA to provide general support (Rodgers et al., 2014), c) *alumni mentors*, i.e. three alumni students with active industry experience, who provided systematic feedback on student work throughout the semester, d) *industrial mentors* (clients), i.e. five local organizations from various sectors who provided the requirements, project resources and regular feedback on the work in progress and finally, e) *industrial experts*, i.e. three professionals with a minimum of six years of professional expertise in the field, who evaluated the final student projects. The full details of the CoP model design are presented elsewhere (author's reference).

The recruitment of the *industrial* members to the CoP was crucial for the objectives of the study and did not present a significant challenge. Graduate students with a genuine interest in advancing their studies volunteered to help as facilitators, taking the opportunity to deepen their knowledge and enrich their résumés with practical

experience. This incentive also held true for alumni students (mentors), who were young designers in the process of building experience and establishing their professional status. Alumni were also motivated by having had positive academic experiences, a phenomenon that can instigate acts of loyalty towards alma mater (McAlexander & Koenig, 2001). Finally, industrial experts, who tend to hold key organizational positions in the domain, were interested in establishing and maintaining communication channels with the universities to give direction, influence outcomes and draw from a filtered graduate talent pool.

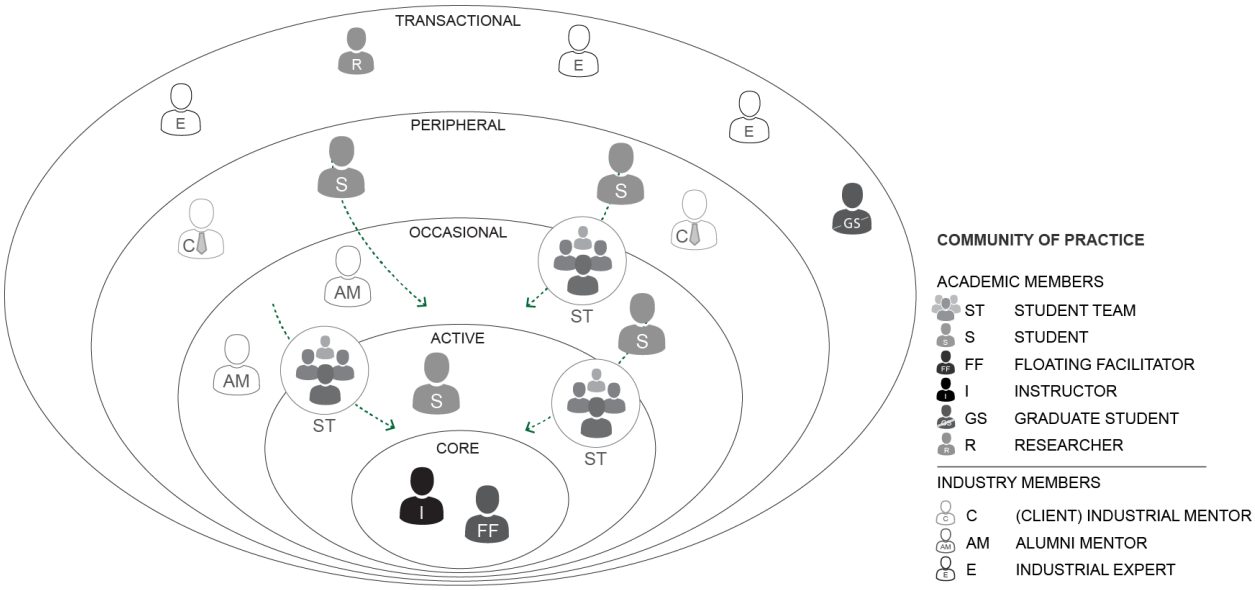

Figure 1. Community of Practice roles and levels of participation (adaptation from original model by Wenger, 1989)

The cross-organizational CoP was largely sustained by technological means for both *team-based* and *community-wide* interactions. The role of technology is critical in that it has the ability to connect geographically and temporally dispersed members, as well as to enable team-based (subgroup) collaboration (E. Wenger, 1998). The experimental group teams used Google Drive, Docs and Hangouts for collective analysis, documentation and generic productivity purposes, ConceptBoard, for brainstorming and experimentation, as well as Axure and Adobe's Photoshop, Illustrator and Dreamweaver, as creativity-support tools (CSTs) for the actual design tasks (Cherry & Latulipe, 2014). These tools collectively enabled team communication, productivity and project management (Nielsen, 1994).

Community-wide collaboration on the design work was mainly supported by Adobe's Behance, an online portfolio and social networking site and Hypothes.is, a browser-based annotation tool. Both supported public viewing, communication and feedback facilities for CoP members.

3.4. Instrumentation

3.4.1. The Web Site Creativity Measurement Instrument (WSCMI)

The WSCMI instrument was developed by Zeng et al (Zeng, Salvendy, et al., 2009) to evaluate the creativity of websites, based on seven key factors (totaling 28 items): aesthetic appeal, interactivity, novelty & flexibility, affect, importance, commonality & simplicity and personalization (see Table 1**Error! Reference source not found.**).

The instrument's *construct validity* relies on foundational literature (Zeng, Salvendy, et al., 2009). Specifically, the WSCMI draws from four different theoretical areas of creativity:

a) Generic creativity theory from the psychology perspective (Hennessey & Amabile, 2010; Sawyer, 2011)
b) Product creativity which is specifically targeted at traditional hardware products, driven by underlying theoretical and empirical evidence in this area (Amabile, 1982; Csikszentmihalyi, 1988; Horn & Salvendy, 2006, 2009). Explicitly, *affect*, *importance*, and *novelty* were integrated as factors from the validated Productivity Measurement Instrument in a study by Horn & Salvendy (2009).
c) HCI and computational creativity which address the needs of more complex information technology products and computer-mediated environments that also cater for social co-creation processes (Karakaya & Demirkan, 2015). This places emphasis on how the creativity processes of users (as authors, creators, developers) are supported by technological tools, as well as on the creative traits of the *outcomes* that develop as a result (in the form of systems, interactive applications, websites and so on) (Hoffmann, 2016; Kantosalo & Toivonen, 2016; Shneiderman et al., 2006; Stephanidis et al., 2019; Zeng et al., 2012)
d) Dynamic, website-specific creativity variables which relate to the interactivity, usability, changeability, personalizablility, aesthetic quality and appropriateness dimensions as perceived by the end-user (Albert et al., 2004; Avouris et al., 2001; Garett et al., 2016; Hassenzahl, 2018; White, 2006; Zeng, Salvendy, et al., 2009). In other words, these involve the consideration of "both instrumental,

pragmatic and non-instrumental, hedonic aspects" (Zeng et al., 2012) of websites as well as the user experiences they generate.

The WSCMI employs a seven-point Likert scale with responses ranging from *strongly disagree* (1) to *strongly agree* (7) for each item of the instrument. It was used at the end of the semester by experts, these being the industrial stakeholders of the CoP as well as graduate students and HCI researchers, to evaluate the final websites produced by student teams in both the experimental and control groups. All factors and items of the scale were thoroughly explained with a focus on website creativity, to the website evaluation participants in real-time collocated or online instructive sessions.

Table 1. Web Site Creativity Measurement Instrument (WSCMI) by Zeng et al (2009)

1. Aesthetically appealing design	1. Artistic 2. Colorful 3. Energetic 4. Beautiful 5. Fascinating 6. Entertaining 7. Engaging 8. Attractive 9. Favorable 10. Desirable
2. Interactive design	11. Interactive 12. Animated 13. Multimedia-available 14. Dynamic
3. Novel and flexible design	15. Original 16. Appealing 17. Flexible
4. Affective design	18. Stimulating 19. Pleasing 20. Delighting 21. Exciting
5. Important design	22. Relevant 23. Important 24. Crucial
6. Common and simple design	25. Infrequent 26. Rare 27. Sophisticated
7. Personalized design	28. Personalized

3.4.2. Feedback coding scheme

Feedback is a key constituent of community-wide collaboration; our focus was thus on the nature of feedback that typically occurs in cross-organizational CoPs in the field of design and relevant domains. We began with an analysis of the feedback posted by CoP members on Behance, which was mainly made up of comments from industrial mentors and partners on various work deliverables.

We used the coding scheme by Cummings et al. (2016) to analyze the content of these posts as they aligned with our research objectives (design feedback). The scheme was developed by integrating earlier work: a) the scheme created by Marbouti et al (2014) that categorizes written feedback from peers on academic design projects and b) the typology espoused by Dannels and Martin (2008) that captures the genre of feedback in design critiques. The resulting scheme is presented in Table 2.

Table 2. Coding scheme by Cummings et al. (2016)

Domain	Category	Description
Focus	Form	Answers the question "what is it?" Typically a noun and could be an analogy to describe the feature
	Function	Answers the question "will it work?" Can typically be identified by verbs. Could also be identified by calculations and feasibility
	Representation	Feedback refers to writing and presentation of the design work
	No Code	Does not fit in any of the above sub-categories
Type	Judgment	When critics reacted to what they saw and rendered some assessment of its quality
	Process Oriented	When critics made statements or asked questions about the student's design approach or process as process-oriented feedback
	Brainstorming	When critics essentially asked questions or made statements about future imagined possibilities for the design
	Interpretation	When critics reacted to what they saw and tried to make sense of the concept or product
	Direct Recommendation (Visual)	When critics gave specific advice about a particular aspect of design using sketching or other visual means
	Direct Recommendation (Verbal)	When critics gave specific advice about a particular aspect of design verbally
	Investigation	When critics requested information
	Free Association	When critics made reactive, associative statements about the design
	Comparison	When critics contrasted the design or design process with something else
	Identity Invoking	When critics made statements or asked questions to suggest that students consider the larger picture of themselves as designers in a future professional community
Tone	Positive	Praise and no suggestion for change. Feedback complimenting the team or design work
	Neutral	Feedback states a fact without any explicit evaluation of work or need for change

	Negative	Feedback implies the design work needs to be changed

3.5. Data collection

As CoPs are complex units that call for multiple perspectives of analysis (social relationships, processes and outcomes), we collected data from various sources in order to capture, understand and triangulate the learning phenomena that emerged, guided by the research questions. Both quantitative and qualitative data were collected throughout the 13-week semester. The following methods were employed: a) 15 after-class focus group sessions supplemented by the instructor's notes (5 teams x 3 sessions, semester-weeks 4-13, time N=444 minutes of recordings), b) 10 post-intervention interviews with team representatives at week 13 to extract individual views in an effort to eliminate team bias (10 participants, time N=253 minutes of recordings) (Gill et al., 2008), and c) a WSCMI evaluation of the final websites (week 13) by the 9 industrial members of the CoP (industrial mentors, partners and experts) as well as 24 graduate students and 4 HCI researchers, to ensure sufficient diversity and objectivity in the evaluations and d) feedback that was posted on Behance throughout the semester (N=101 posts, 9,977 words).

Permission to run the study was obtained from the university and data collection sessions were approved by participants through consent forms.

4. Results

We present the findings in the following order to facilitate a better, more structured understanding with regards to the objectives of the study.

4.1. RQ1: website creativity evaluation (WSCMI) scores

A total of 317 *website evaluation* ratings were analyzed in order to derive findings as to the creative value of the websites produced by teams in the experimental versus the control conditions (RQ3). We initiated this by investigating the internal consistency of the scale. Cronbach's coefficient alphas for each of the seven factors of the scale ranged from 0,87 to 0,97, which suggests high internal consistency.

Independent t-tests resulted in statistical differences with medium and large effects (Cohen, 1992). Overall, creativity ratings for the experimental group's websites (M=4,17, SD=1,34) were significantly higher than the control group's (M=3,23, SD

=1,64) after Bonferroni correction for Type 1 error (i.e., alpha level set to .05/7=0.007) (see

Table *3*). This provides evidence that social participation in the cross-organizational CoP produced significantly better creative outcomes for learners in the experimental condition.

Table 3. Comparison of website creativity evaluations - independent samples t-test for control and experimental groups

	Control			**Experimental (CoP)**			t	d.f.	P	Cohen's d
	N	Mean	S.D.	N	Mean	S.D.				
Aesthetically appealing design	143	2,97	1,60	167	3,89	1,28	-5,46	271,03	<0,001	0,628
Interactive design	144	3,30	1,51	173	4,30	1,20	-6,37	270,15	<0,001	0,727
Novel and flexible design	144	2,97	1,50	173	4,00	1,27	-6,52	281,67	<0,001	0,742
Affective design	144	2,73	1,60	170	3,76	1,30	-6,21	274,80	<0,001	0,710
Important design	143	3,47	1,61	173	4,22	1,17	-4,66	253,58	<0,001	0,535
Common and simple design	144	2,81	1,34	172	3,45	1,31	-4,23	301,63	<0,001	0,478
Personalized design	143	3,28	1,72	173	4,01	1,52	-3,91	286,39	<0,001	0,444
Overall mark	144	4,34	2,26	173	5,77	1,67	-6,31	258,22	<0,001	1.223

4.1.1. Theoretical and empirical inferences

Based on the emphasis on *Novelty (novel and flexible design)* and *Value (important design)* as the predominant factors in the definition of creativity by foundational research, we feel that it is important to clarify how these were reflected in the instrument's structure and the respective findings (Amabile & Pillemer, 2012; Bruner, 1962; Furnham et al., 2011; Horn & Salvendy, 2006, 2009; Kaufman & Baer, 2005; Mumford, 2003; Runco & Jaeger, 2012; Sternberg & Lubart, 1999). We discuss these, and highlight associations between them and other WSCMI criteria that produced similar scores in the experimental group's evaluation results (Table 3).

Novelty, a critical criterion for creativity, constitutes one of the three major factors integrated in the WSCMI from Horn's & Salvendy's (2006, 2009) earlier work on the

measurement of product (hardware) creativity. It is reflected in the 'Novel and flexible design' factor of the instrument. In website-creativity terms, *novelty* is understood as the striking and engaging design with respect to its aesthetic (i.e. Graphical User Interface) as well as *interactive* dimensions (functionality and usability) (Zeng, Proctor, et al., 2009); these are reportedly crucial in the user's perception of the overall product *value* (importance) (Ahmad & Khan, 2017; Avouris et al., 2001). The fact that these two items (novelty and importance) fell quite close in the respective scores from the WSCMI evaluations was therefore an anticipated outcome in the study (see table 3).

That said, it is also the *flexibility* dimension – reflected in the continuous updates of the site's content and interaction modes – that sustains the website's perceived *novelty* over the course of time by end-users. In other words, the two dimensions are intertwined within the scope of website creativity. Although this study did not follow a longitudinal approach (so as to judge the evolution of the various websites over time), the website evaluation team was guided by researchers who explained in real-time how each websites' interface catered for such prospective updates.

Another definitive criterion for creativity, *value* (or *appropriateness*), was explicitly and implicitly measured through the WSCMI. Firstly, the website's value was defined through " the product's level of *relevance*, *importance* and *cruciality* measured in the 'Importance' dimension" (Zeng, Salvendy, et al., 2009). Results with respect to this dimension made a significant contribution to the overall WSCMI evaluation, by scoring as second highest in the scale (Table 3).

Nonetheless, *value* was also implicitly represented in other WSCMI factors. Specifically, *interactivity* (*interactive design factor*) in the context of websites, is a major criterion for creativity, that amongst others, encourages users to engage in creative exchanges with the site (Shneiderman & Plaisant, 2010; Zeng et al., 2012; Zeng,

Salvendy, et al., 2009). *Interactivity* generates *meaning* and *enjoyment* in the dialogic experience between user and website (i.e. the ways in which the latter reacts and responds to user actions) and strengthens its perceived *effectiveness*. *Interactivity* has thus a central role in the overall user-perceived *value* of the website through these constitutive dimensions (Kuan et al., 2005; Zeng, Salvendy, et al., 2009). WSCMI findings from this study confirm that *interactivity* was in fact the primary contributor of the overall creativity scores, surpassing criteria such as *novelty* and *importance* (*value*) (Table 3).

Finally, *personalization*, a form of website 'individualization', surfaced as the third highest criterion for creativity in the WSCMI evaluations. This is explained as the degree to which the website can automatically or manually be configured to offer customized content, structure and presentation according to user-defined preferences (Canali et al., 2005). As this feature empowers users to become active 'designers' of the website, it enhances the *hedonic* user-experience and augments *interactivity*, which inherently contributes to better perceptions of the website's *value* (Benlian, 2015; Desai, 2016). The close relationships between these key creativity criteria (importance, interactivity, personalization) were indeed also observable through their similar scoring in the WSCMI evaluation results (Table 3).

Overall, Zeng et al (2009) posit that the sum of WSCMI factors and items augment the *value* of websites as aesthetically *appealing*, *interactive* and *novel* products, that are *flexible* of *adjusting* to individualized preferences and evoking positive *affective* responses from users. As results from this study, find these criteria at the top of its score list as the key determinants of creativity, they confirm their role and inter-associations in underlying theory and contribute towards the validation of the construct of website creativity within the scope of the WSCMI.

Social judgement

While *novelty* is key, the *appropriateness* or *value* of a product can be defined, with respect to a given domain, based on social judgement (Amabile, 1982; P. B. Paulus & Nijstad, 2003; Sawyer, 2011). As value is therefore socially defined, we discuss how social judgment was enabled in the administration of the WSCMI, within this study.

As discussed, the WSCMI draws in a high degree from *product* creativity principles, which see this as entrenched in the interactions between the *product*, the *user* (judge) and the *domain* at the *time* of interaction (Csikszentmihalyi, 1988; Horn & Salvendy, 2006). The perception of creativity in this sense lies in the eyes of the beholder; its evaluation criteria are thus understood based on specific *societal* and *historical* characteristics that derive from the evaluator's background, perspectives, purpose, needs, expectations, limitations, and the way that all these shape the user experience at the *time* of the interaction.

This study recruited a diverse range of expert stakeholders (alumni mentors, industrial experts, industrial mentors, graduate students, HCI researchers) to assess the creativity of websites produced by the students. While they were called to evaluate the outcomes according to a predefined set of criteria, their own individual and often, quite different perspectives, needs, limitations and expectations from these outcomes were likewise infused in their decisions, expanding in this way the breadth of *social judgment* in the measurement of creativity. Most importantly, this diversity in the evaluator sample confirms that amongst other factors, *novelty* and *value* as the main indicators of creativity, were evaluated consistently across a wide range of perspectives and biases.

An additional point to be made is that the majority of evaluators, participated in the CoP, and where thus given a window into the team and group (class) processes during project development in multiple occasions. In other words, they had opportunities to

formatively review the teams' creative actions (or reactions as related to *feedback*) and construct a holistic understanding of creative activity, guided by the contextual dimensions (social, material, time,) of the group processes that defined creativity in the final outcomes.

We argue that the sum of the above constitutes a fundamental contribution of the cross-organizational CoP model towards HE. The evaluation of learning and outcomes – with *creativity* being a primary variable - was not restricted to single-assessor approaches that are characteristic and limiting of traditional pedagogical approaches (Boud & Falchikov, 2006; Carless & Boud, 2018; Loizides et al., 2019). Instead, it expanded the assessment pool to include heterogeneous agents who contributed authentic feedback. Through their recurrent interactions with the 'creators' and the subsequent gains in contextual evidence, it diversified the degree of *social judgment – in* measuring creativity more holistically and both *formatively* and *summatively*.

4.2. RQ2: Feedback in community-wide collaboration

For research question 2, we looked at the nature of the feedback that emerged in the CoP. Feedback posts submitted over the 13-week semester were downloaded and imported in NVivo for content analysis (RQ2). Two researchers analyzed the data using priori coding (Saldaña, 2015) based on the coding framework (see Table *4*); a random sample (12%) of the data was screened for inter-rater reliability, producing a "substantial" level of agreement of k = 0,76 based on Cohen's Kappa coefficient, according to Viera & Garrett (2005).

The recorded units were defined by the meaning of each statement (sentence or paragraph) and employing a continuous approach (allowing for multiple classifications of text in more than one code when the data required more than one interpretation), rather than a dichotomous one (mutually exclusive) (Weber, 1990). Overall, the process resulted in a total of 1,235 references, split into the categories of *Focus*, *Type* and *Tone*. No new codes emerged as the data was fully described by the scheme. The prevailing category codes were 'Form' (Focus category), 'Direct Recommendation - verbal' (Type category) and 'Negative' (Tone category) (see Figure 2).

Table 4. Feedback coding frequencies

	Instances	Percentage
FOCUS	376	30,4%
FOCUS\Form	252	20,4%
FOCUS\Function	115	9,3%
FOCUS\No Code	4	0,3%
FOCUS\Representation	4	0,3%
TYPE	517	41,9%
TYPE\Brainstorming	41	3,3%
TYPE\Comparison	19	1,5%
TYPE\Direct Recommendation – Verbal	240	19,4%
TYPE\Direct Recommendation – Visual	0	0
TYPE\Free Association	3	0,2%
TYPE\Identity Invoking	0	0
TYPE\Interpretation	32	2,6%
TYPE\Investigation	29	2,3%
TYPE\Judgment	151	12,2%
TYPE\Process Oriented	2	0,2%
TONE	342	27,7%
TONE\Negative	183	14,8%
TONE\Neutral	94	7,6%
TONE\Positive	65	5,3%
Total	1235	

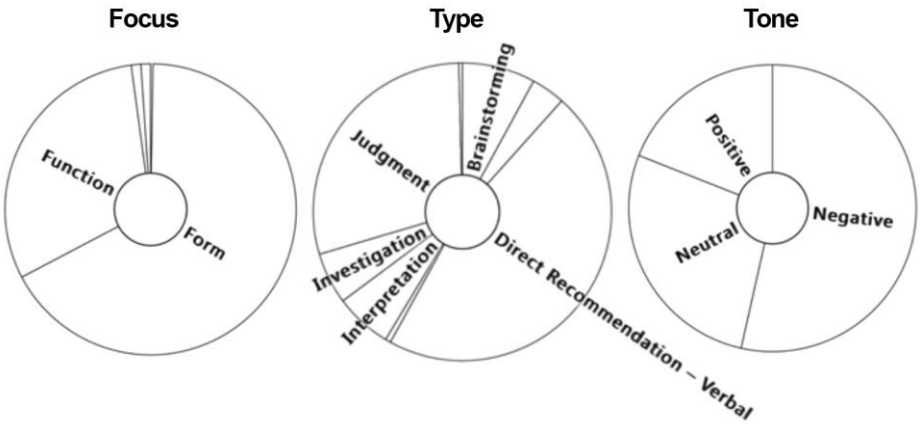

Figure 2. Coding references hierarchy charts

4.3. RQ2: Interactions between creative outcomes (WSCMI) and feedback

Following findings from the website evaluations (WSCMI) and the feedback analysis, we were interested to uncover possible links. The scores from feedback were thus compared against those from the WSCMI for the teams in the experimental condition only (RQ2). A Pearson coefficient was computed to assess their relationships. No correlations were found between *positive* feedback and WSCMI scores (see Table 5). However, a significant negative correlation was found between *negative* feedback and WSCMI scores [r=-,859, n=21, p<,01].

Table 5. Multiple correlations between feedback tone and website evaluation scores (WSCMI)

		Feedback positive	Feedback neutral	Feedback negative	WSCMI score
Feedback *positive*	Pearson Corr.	1	,414	-,161	-,318
	Sig.		,062	,485	,160
Feedback *neutral*	Pearson Corr.	,414	1	-,773**	,640**
	Sig.	,062		,000	,002
Feedback *negative*	Pearson Corr.	-,161	-,773**	1	-,859**
	Sig.	,485	,000		,000

Specifically, *negative* feedback appeared to be a significant predictor for decreased website creativity scores, while the reverse (*positive* feedback) was not applicable. This suggests that while the experimental teams' creative outcomes were higher (compared to the control group), they could have been improved following a more moderate versus a harsher approach to feedback from the expert CoP members. The data also indicates that *neutral* comments, the majority of which fall under the 'Direct Recommendation' type (see
Table *6*), were positively correlated with WSCMI scores (r=,640, n=21, p=,002). This indicates that constructive reviews and expert advice delivered in plain (rather than negative) tones have the potential to yield improved outcomes.

Table 6. Coding frequencies based on feedback type and tone

Tone	**Negative**		**Neutral**		**Positive**		
Type	instances	%	instances	%	instances	%	Total
1. Direct Recommendation	140	27,3%	77	15,0%	23	4,5%	240
2. Judgment	93	18,2%	8	1,6%	50	9,8%	151
3. Brainstorming	13	2,5%	18	3,5%	10	2,0%	41
4. Interpretation	19	3,7%	7	1,4%	6	1,2%	32

5. Investigation	14	2,7%	14	2,7%	1	0,2%	29
6. Comparison	13	2,5%	4	0,8%	2	0,4%	19

4.4. RQ3: Perceptions of feedback in community-wide collaboration

As previously mentioned, feedback in this study was found to emphasize the visual attributes of the student work; it also tended to come in the form of direct recommendations expressed in a negative tone. We were interested to understand and triangulate these findings by examining the qualitative data from the focus-groups and the post-intervention interviews with students, as well as the supplementary notes from the instructor.

The data was analyzed, using inductive thematic analysis, based on a 'reflexive' approach, which focuses on extracting the essence of meaning, with the primary aim to draw substantial conclusions (Braun et al., 2019). Specifically, we looked for mentions of their community-wide *collaboration*, *feedback* and perceptions of their creative outcomes as well as the possible interactions between these. Following multiple rounds of reviewing and data saturation, the analysis yielded three main themes: a) *Feedback volume, time pressure & learning regulation*, b) *Feedback tone, self-concept & renegotiation of learning & achievement* and c) *Feedback focus, complexity & metacognitive activity*. The structure of each of these themes is based on the a) *causes* (the interactions of collaboration incidents), b) *effects* (how these were perceived), and c) *actions* (generated by the teams as a result). The themes are discussed in the following sections.

4.4.1. Theme 1: Feedback volume, time pressure and learning regulation

The majority of student comments on the feedback provided by external CoP members mentioned the element of time-pressure. The learners felt somewhat overwhelmed by the reviews; they had to dedicate time and effort to understand and process the feedback and then actively address it:

Team B PM:	They gave as a lot [of feedback], you need a lot of time, at least three hours each time to analyze what they say (…) it's like 2000 words!
Team B member:	You get lost [in managing the volume of feedback] at some point…
Team C member:	He [alumni mentor] gave us too many comments!

Inevitably, the large volume of comments forced team members to engage systematically with the project and be more accountable, allowing less room for "free-riders" (Saghafian & O'Neill, 2018). Students actually commented on their increased motivation to improve in response to the feedback:

> Team D member: [after receiving extensive feedback that required many changes] (…) within a couple of days, we all worked on it much more and we changed it completely!
>
> Team B member: [commenting on the extensive feedback] If you get to the point that you can manage the comments – it's really very good for us.

While highly valued by students, feedback gradually became burdensome. The projects advanced into phases with complex deliverables, which in turn generated lengthier and more elaborate revisions from the external CoP members. The students' receptivity to feedback dropped during these stages and there were noticeable signs of friction between team members all trying to balance their workload against new requirements. The effect on their schedules was perceived as hindering the teams' creative performance:

> Team C PM: I believe that if we didn't have so much time pressure [as a result of the feedback], we would be much more creative.

Nevertheless, despite perceptions of compromised creativity, feedback did in fact spark collaborative amendments that led to the creative outcomes (i.e. the websites) being assessed as significantly better. This aligns with existing literature which confirms that moderate time-pressure and tension are precursors to effective collaboration, as they lead to deeper engagement, better negotiations and improved creative problem-solving practices (deChambeau, 2017; E. C. Wenger & Snyder, 2000). Likewise, students reported action-taking incidents, to fine-tune and regulate their work processes in order to counteract such feedback-induced delays:

> Team C PM: Three of us worked independently, in parallel with the other two until now [referring to the more

	advanced project stages], but now we need to break the [roles and tasks] down even further I think…
Team C member:	Yes we don't have any other option now (…) it's also easier to communicate and reach consensus with two people [rather than three or more, following the delay from the extensive feedback].

Other than reconfiguring roles and tasks, students also explored tools that could help them achieve their goals faster without compromising the desired quality of the design deliverables (Schoenfeld, 2016):

Team C member:	The tool that we used to plan the schedule saved us an unbelievable amount of time compared to Excel [they searched for different software to speed their work processes up in response to the feedback-induced delays].

Clearly, the amount of feedback resulted in squeezed timeframes, which pushed teams to revisit their work practices and enforce new, 'just-in-time' judgments as part of an enhanced co-regulated learning process (Garrison & Akyol, 2015).

4.4.2. Theme 2: Feedback tone, self-concept, transformed learning and re-negotiation of achievement

Feedback, by nature, tends to be negative more often than not: its objective is to identify parts of a work that warrant attention and propose means of improvement (Hyland & Hyland, 2001; Värlander, 2008). In this study, feedback came mostly in the form of 'direct recommendations' (process-oriented), rather than plain 'judgements' (task-oriented). Direct recommendations may have been used as a good mitigation strategy for "sugar-coating" negative remarks (Hattie & Timperley, 2007). The analysis indicated that some of the student work was subject to harsh criticism, which often reflects the culture of real-world practice in the field of design and its related domains (Flynn, 2005; Hokanson, 2012). Team members were thus concerned and became invested in resolving the issues mentioned in the feedback. When they sought the instructor's opinion, they were prompted to make their own judgments and follow up with actions. As such, the teams had to act autonomously. They researched theories to verify the credibility of the negative reviews or to support counter propositions. Such theoretical sources might have otherwise been overlooked or learned by rote for the

purposes of formal assessment (i.e. exams). In this case, students were investigating the theories with a genuine interest to support their design prerogative:

Team C PM:	The theory we went through yesterday about complementary colors? He [the alumni mentor] commented on that and we thought "oh… we should have thought about that; we should have done this ourselves!" [Instructor's notes: students then proceeded to investigate the matter further to understand and act according to the feedback instructions.] (…) We now wrote these as guidelines down and we really hope they will help us again in the upcoming project phases.

While critical feedback may have produced a lot of corrective activity, it also brought the work's weaknesses and gaps into focus. As a result, students often questioned their self-worth. This was also clear through their self-assessment, which at times veered towards the critical:

Team C PM:	[Following negative feedback] It is discouraging when you spend all this effort to design and set it all up (…) it is not the best result that we could produce, but we did all we could.

It became apparent that the new, demanding criteria delivered in a negative tone by the external members of the CoP forced the teams to reform their self-concepts and re-negotiate their perceptions of achievement accordingly:

Team C member :	We see how it is now [in terms of achievement and success based on real industry criteria] when we'll leave university… not how we imagine it but how it actually is in reality.
Team C PM:	[In the absence of the CoP's feedback] I would not have been able to do everything on my own, and I would have had the illusion that I am doing well!

Additionally, one of the key ways in which the feedback resonated was that students identified themselves with its originators. As the majority of the posts were submitted by alumni mentors who moved along similar trajectories to theirs, the students perceived their comments to have value:

Team D member :	[The feedback] really matters when you have the same background [as the alumni mentors], you think alike and the difference just lies in their professional experience.

Overall, these incidents denote that the learners' self-concept was pragmatically negotiated through their CoP membership, which exposed them to real-world practices. Lacking experience, learners would typically judge their performances more leniently, as a form of "naïve, over-confidence" (Gehlbach et al., 2008; Gormally et al., 2009). Instead, the CoP feedback triggered a degree of disillusionment in the learners, who renegotiated the meaning of achievement with regards to the wider community (industry).

4.4.3. Theme 3: Feedback focus, complexity and metacognitive activity

Collaboration with external CoP members often involved inconsistent and ambiguous feedback. This was to be expected, as the members came from different practices, with varying degrees of knowledge and expertise and different personal expectations from their CoP membership (Culver & Bertram, 2017). The impact of receiving feedback, which was at times unhelpful, was twofold. Some learners took this as a chance to make decisions more autonomously, while others raised objections, saying the feedback was too difficult to follow (Zajonc, 1980). While the feedback was broad, in that it focused on diverse dimensions of the work (i.e. visual, technical, usability, marketing/promotional), it often lacked structure, coherence and specificity.

Its ambiguous nature at times gave a sense of freedom and the opportunity to engage in enhanced creative activity:

Team D PM :	You can have better creative results if you are not pressured [through client feedback] and they give you more space (…). But when he is lecturing all the time and micro-manages you, at this point you just do the work mechanically in order to get it done.

Team A	[When students were asked to comment on how creative they were] The client's requirements were poor so this gave us flexibility to design the prototypes (...) and take initiative!

At other times, such feedback was somewhat disorienting, particularly when it contained contradictory comments. This is, in fact, an authentic phenomenon which is highly representative of real-world practice, especially in the case of professional teams who follow a user-centered design approach. Opinions from multiple stakeholders (i.e. users, clients, management) may be conflicting, and yet need to be critically judged and factored into the work, following collective assessment and informed decision-making (Marcolino et al., 2014). The students expressed concerns over the impact this had on their team creativity:

Team B PM:	Creativity is compromised by conflicting opinions (i.e. when one likes it and the other doesn't), in the course of development as these disturb [the creative] momentum.
Team E member:	(…) it's confusing. They had totally opposing opinions… one of the mentors told us that it [the website prototype] was quite good, in terms of layout (…) while the other told us that she got lost, she had no idea where she was and what she could do [on the website]!

The provision of feedback also elevated the degree of complexity in the collaboration. As a result, the students dedicated extra effort to understand and decide what to do in response. They meticulously scrutinized the body of feedback and communication and closely reflected on and compared it against newer developments in their work. As in theme 2, they again researched theoretical and empirical sources (i.e. forums), to form judgments and decide on next steps. This indicated a deep form of collective meta-cognitive activity, which aims to assess the team's understanding, their contributors' opinions, the value of the work produced and the respective decisions and propositions about the subsequent course of actions (retain, reject or aggregate opinions) (Garrison & Akyol, 2015; Veenman et al., 2006).

5. Discussion & conclusion

This study reported on three key variables in HE students' participation in a cross-organizational CoP: the types and content of feedback provided by community members as part of the social collaboration, the perceived effects of this feedback on the learners, and, as a result, the creative outcomes that the latter went on to achieve.

More specifically, the study sought to report on the types of feedback that typically emerge from cross-organizational CoPs in the field of design and other related disciplines. The feedback submitted over a 13-week period was content-analyzed and categorized under the dimensions of *focus*, *type* and *tone* (**RQ2**). The findings indicated that the prevalent codes were: a) *Form* (in the *Focus* category) which refers to the visual design attributes of the work, b) *Verbal Direct Recommendation* (in the *Type* category), which refers to advice and suggestions for work enhancements, and c) *Negative* (in the *Tone* category), which refers to the tonality and feel of the reviews. In relation to this, qualitative data from student focus groups and interviews as well as instructor notes informed the study about how leaners experienced these dimensions of CoP-wide collaboration and hence, the feedback delivered to them (**RQ3**). Evidence indicated that *feedback* (positive or negative) was the underlying cause for better creative outcomes (WSCMI) **(RQ1)** as it caused team breakdowns and improved motives, which in turn led to opportunities for enhanced *learning regulation*, *meta-cognition* and the *renegotiation of learning & achievement* for learners. From a learning perspective, this finding is consistent with previous work positing that such perceived barriers can urge learners to reconsider their progress and regroup accordingly (Fischer & Bell, 2004).

It also coincides with more evolved theoretical perspectives that do not attempt to isolate creativity, as a mere attribute of *products* alone. Instead, the higher creative outcomes (RQ1) were analyzed against connected findings that explain their significance. The purpose if this study was to investigate creativity as *entangled* and *distributed* in the interactions of CoP members, dealing with various *artifacts*, at the intersection of *cultural contexts* and across *time*, as part of a compound approach (Glăveanu, 2014; Hennessey, 2017). It thus approached the understanding of creativity as a situated phenomenon, that materialized along a continuum, rather than in isolated and de-contextualized performances. Furthermore, it should be mentioned that this study is part of a compound body of work, which aims to ground its creativity inferences, as much in its measured outcomes, as in the understanding of the broader spectrum of variables that structure the

processes that lead to such outcomes. This larger body of work investigates the *context* (physical/technological), the *epistemic* processes and the *social* phenomena that are in place or emerge as ingrained in the creative processes and outcomes of the teams involved. Nonetheless, these fall outside the scope of this study and are therefore extensively discussed in parallel work (author reference).

With regard to feedback as a key component of the *social* dimensions of CoP processes (**RQ3**), the analysis of findings inferred that a) extensive feedback of b) a particularly negative *tone* and c) an ambiguous or conflicting *focus*, imposed considerable time-pressure, raising the degree of complexity and reducing the students' self or collective concept as a result. This finding agrees with previous work on self-beliefs, suggesting that exposure to unfamiliar, demanding circumstances and harsh feedback (i.e. based on industry-level expectations) can challenge learner beliefs around their abilities and outcomes (Chong & Ma, 2010; Gehlbach et al., 2008; Tierney & Farmer, 2002). Conversely, teams who lack such challenging experiences (i.e. in typical classroom conditions) tend to perceive their aptitude and performance "quite positively" (P. Paulus, 2001). This also aligns well with our findings which suggest that the link between feedback and self-beliefs in *industry-academia CoPs* is an important aspect that warrants further investigation.

This is not a negative result; in fact, it's a rather promising one. As suggested by learners themselves, gaining familiarity and knowledge of industry practice constitutes an intrinsic trigger which leads to a valuable experience, even if it feels frustrating while it's happening. From this perspective, we see how the *industry-academia CoP* experiences informed the learners' perceptions, who will graduate and become young professionals who can tackle real-world messy problems (Albats, 2018; Grohs et al., 2018). Through *legitimate peripheral participation* in the CoP, students were gradually exposed to critical information about the real-world practice and generally the conditions, criteria and prospects of the broader domain, while still at university. The meaning of achievement was repeatedly questioned and negotiated throughout their membership, following the paradigmatic trajectories and accomplishments of more competent others from the professional sphere (E. Wenger, 1998). In this study, we deduce that this is a process of pragmatic realization or 'grounding' that transforms the identity. It seems to occur when knowledge of a subject and its domain expands based on influences from the broader community, a fact that enables novices to pragmatically position themselves within it and set renegotiated goals as a result. This awareness of the self in relation to the domain

constitutes a key 21st century skill of "living in the world" (Binkley et al., 2012). It is therefore apparent that the cross-organizational CoP model can offer significant contributions in the area of Design Studies and related fields in HE and hope that this work will guide further CoP-related research and practice in HE settings.

6. Limitations and future work

This study is limited by both the small number of participants and the localized nature of its sample; the students were recruited from a single department of a local university and grouped in two cohorts by means of academic registration (convenience sampling). Although its findings cannot easily be generalized to a wider and more diverse audience, the study provides evidence and guidance of its replicability with regard to the design of the technological, epistemic and more importantly, the social infrastructure of the model. The participation incentives for various external roles that are crucial for cross-organizational adaptation in particular have been thoroughly explored.

Additionally, based on methodological concerns over the use of score-based tests, with respect to construct and predictive validity (Sawyer, 2011) and given the multi-dimensionality of creativity, the results extracted through the administration of the WSCMI alone, cannot draw definitive and objective conclusions as to the creativity of student outcomes as standalone methods. A proposed amendment is to employ additional evaluation methods or extend the assessor sample to ensure validity.

However, these findings correlate with additional *epistemic* results and are further supported through the analysis of formatively collected qualitative data on interrelated contextual factors (technology, physical setting, social phenomena), that help explain and augment such creativity results. These fall out of the scope of this study and are therefore reported in parallel work.

The next steps for this work is to generate guidelines based on the findings for the benefit of educators, designers or researchers who wish to leverage the potential of bridging the academic and industrial spheres, in order to improve learning in the field of design and related domains.

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