We Built Our Own Worlds - Story Canonicity and Indirect Collaboration in a Shared Story World

Alan Tapscott[1], Joaquim Colás[2], Valeria Righi[2], Carlos León[1] and Josep Blat[2]

{alan.tapscott,cleon}@ucm.es - joaquim.colas,valeria.righi,josep.blat}@upf.edu
[1]Facultad de Informática, Universidad Complutense de Madrid
[2]Grup de Tecnologies Interactives, Universitat Pompeu Fabra

Abstract—In this work, we conducted a longitudinal study to understand better how authors collaborate when building shared story worlds. To accomplish this goal we deployed Chronoverse, a tool specifically designed for this purpose that provides authors with a common story timeline and character faction tags. The study had three distinct phases. In the first phase, undergraduate students (the authors we study) used Chronoverse to develop their stories in a common context during a lab that lasted four weeks. In the second phase, a jury rated the authors' contributions in terms of coherence and consistency, attempting to measure the integrity of the shared story world. In the third phase, a larger crowd of readers rated the stories according to their preferences and shared their opinion of what stories belong to a common overarching story. The results suggested that the initial story, introduced by the researchers, was given priority and considered more canonical or "official" by the authors, jury and readers. Author groups did not reference each other's contributions directly, but achieved consistent and coherent results indirectly by adhering to the initial story in terms of plot and tone. The usage of tags in the design of Chronoverse was positively received by authors and enhanced the plot and tone consistency perceived by readers.

Keywords—*collaborative story worlds;story canonicity;indirect collaboration.*

I. INTRODUCTION

Collaborative writing is a challenging task. However, the potential benefits of collaboration are motivating enough to encourage studies that seek to understand and improve the co-authoring of all sorts of texts. Writing fiction collaboratively using a shared story world represents a specific kind of challenge. Authors must share their conceptions of the story world's contents to write consistently, maintaining the impression that all media belongs to the same continuity. For the most part, story worlds do not exist explicitly; they emerge from the facts established by the author or authors in the story. Large fiction franchises, often involving multiple authors, solve this through the usage of internal documents that keep track of the plot developments, documenting the past, present and even future of the fiction, along with relevant character biographies and other fictional encyclopedic content. For instance, TV shows often rely on a confidential bible maintained and used by all screenwriters as reference to collaborate consistently. This seeks to avoid alienating the audience with inconsistencies and incoherences. While this kind of solution has been successfully used in scenarios with over a dozen authors, there is a clear challenge in a hypothetical large-scale online, crowdsourced scenario.

In creative writing, authorial style and artistic vision are important, as well as the capability to build interesting fictional worlds, especially for fantastic genres. Facts contained in the narrated story deviate from our reality up to some degree, presenting landscapes and characters that only exist in our imagination. For the current study, we consider the story world the set of elements (e.g., characters, locations, plots, motivations, rules) that constitute the world implicitly defined by a story along with the relationships between each other. According to Tolkien and his conception of secondary world [1] (a definition we believe to be close to our story world), all the elements (i.e., geography, characters, language and timeline) are interdependent and require internal consistency to suspend disbelief, becoming credible to the reader. Schmidt and Bannon have an extensive publication track that introduces the Common Information Space [2][3], defined as "...a central archive of organizational information with some level of 'shared' agreement as to the meaning of this information (locally constructed), despite the marked differences concerning the origins and context of these information items." We believe that this definition is conceptually aligned with our conception of a shared story world in the sense that it contains relevant data introduced by distinct authors and despite being potentially different, it must agree or be coherent to some degree. Bannon and Bødker discuss the dialectical nature of common information spaces and the challenge of putting information in common and interpreting it [4]. Despite presenting distinct scenarios, most of the considerations for common information spaces are very likely to appear in a shared story world and must be addressed. Mainly, Bannon and Bødker insist on the need for a common information space to be accessible and malleable while providing reliable information. Most of the relevant literature focuses either on the technical implementation of concurrent writing systems or on the narratological study of story worlds. Despite the emerging relevance of fiction transmedia story worlds, both in commercial and amateur contexts, to our best knowledge there is no formal study focused on collaborative authoring and story worlds published. This work aims to understand better the dynamics of collaborating authors when contributing to a shared story world, using computer-assisted collaboration to monitor and measure relevant aspects, such as cross-referencing, coherence and plot/tone consistency.

The study is structured in the following way. In Section

2, we provide a brief discussion of works that deal with relevant problems. Next, in Section 3, we describe our three months' longitudinal study where lab students contributed into a shared story world using Chronoverse, a prototype tool we designed and deployed to support the co-authoring of shared story worlds. Also in Section 3 we describe the jury and reader evaluation of the results from the longitudinal study. We present the results of the evaluation in terms of consistency, coherence and co-existence of an overarching story. Finally, in Section 4, we discuss the implications of the results and conclude with the insight learned from the whole study, along with potential directions for hypothetical subsequent research.

II. RELATED WORK

There have been many works that have studied the usage of computer-based platforms to support collaboration. ShrEdit by Olson et al. [5] was a shared collaborative text editor meant to aid designers in brainstorming ideas. According to the authors, groups that used the editor produced less ideas ranked as more creative. This might imply that in a similar context, the usage of a digital platform for collaboration might prioritize quality over quantity. Posner and Baecker [6] present a taxonomy based on interviews that describes joint writing in the following terms: roles played in the collaboration, activities performed in the writing process, document control methods used, and writing strategies employed. This was later expanded by Lowry et al. [7] with collaborative writing activities, document control modes, roles, tools and work modes, a categorization that could be helpful in designing an adapted user experience. Google Docs, the popular collaborative word processor, has been studied in some works from the educational perspective [8], the longitudinal perspective of a large, diverse organization [9] and a tool to write educational papers [10] amongst others. Overall the design of Google Docs seems very appropriate for collaborative work in a computer platform.

Some other published works deal with similar scenarios such as Robinson's exploration of collaboration in authoring multimedia stories through specific devices [11]. Krowne and Bazaz discuss authority and territoriality in a study of collaborative editing systems [12], this is especially relevant in collaborative systems that deal with creativity and authoring. In the context of a shared story world and multiple collaborating authors, territoriality could be a very important factor to take into account. Likarish and Winet attempted to reproduce the surrealist Exquisite Corpse writing game on Twitter [13], attempting to "... understand the practical pitfalls of synchronous community-based authorship and to recommend methods of avoiding them." Besides reporting successful participation, Likarish concludes by acknowledging the need for "...providing structure via a wiki or suit of tools to enable authors to track details as well as the importance of community self-policing..." We share the belief for tools that introduce structure into the creative process. Thomas and Mason bravely attempted to write a novel in an open process [14] using a wiki platform. The wiki proved to be a competent and useful tool for structuring the narrative thanks to its familiar and accessible nature. According to the authors inter-author collaboration dynamics were challenging, citing content deletions or major restructuring performed by a single author as the source of conflicts. Among the other relevant remarks from the authors, there seems to be a dichotomy between contribution order and creativity, highlighting the importance of contribution sequence and timing when building this kind of systems.

Relevant works that seek to explore collaboration have resorted to the usage of timelines to provide adequate user experiences. Thiry et al. use a timeline in Project Greenwich [15], a tool meant for people to author their own personal digital timelines. In their work, Thiry et al. study the usage of the timeline as a vehicle that helps multiple authors in connecting past and present contributions. The capability to collaborate over time seems to be especially desirable in the context of an evolving shared story world. Some other interesting usages of a timeline include a programming interface by Cardoso et al. [16], medical records overviews by Reddy and Dourish [17], an adaptive timeline interface to personal history data by Ajanki et al. [18] and as an aid for history learning by Pyshkin and Bogdanov [19].

III. STUDY

The following section describes the longitudinal study, including its motivation, the prototype used and the methodology and results for each of its phases.

A. Context and motivation

Since the academic course of 2012-2013, Computer Science and Audiovisual Engineering undergraduates have attended the Audiovisual Language and Interactive Storytelling subject at UPF, participating in the lab and creating their own visual novels. Participants are distributed in groups of three to four students. Over two months, each of the groups creates a visual novel, including its design, script and implementation. The teachers were surprised by the convergence of the plots and tones of the stories, even though they never encouraged collaboration. Despite the lack of hard evidence to support the claim, informal observations suggested some students were collaborating indirectly, using common elements in their stories. Social and cultural trends had an impact in the creative process, as well as the university environment. For instance, every year featured multiple post-apocalyptic stories (a popular recurring theme in current popular fiction) and roughly half of the plots happened in the student's university (UPF). This observation served as motivation for the deployment of Chronoverse, a digital collaborative tool meant to reinforce the collaborative dynamics and the consistency of their collaborations.

B. Chronoverse

Our prototype, Chronovese, was an online tool meant to help authors in collaborating to produce media based in a shared story world.

Figure 1: Chronoverse interface

Chronoverse allowed authorized users to introduce their own original scenes. As seen in Fig. 1, every scene contained a title, a short description, a date, an optional picture and optional tags describing the involved factions or groups of interest. On the bottom of the screen users could see a timeline with all the existing scenes. The usage of a timeline metaphor for the chronology of all scenes was meant to reinforce, for every contribution, the sense of belonging to the same continuity. Since all scenes had a date and were rendered inside the same timeline, we expected to provide an enhanced sense of coexistence in the same story world for all scenes. Also, as seen in the previous section, timelines are useful to connect past and present resources [15]. We made authors split their stories into scenes to promote the intertwining of plotlines. By providing a common canvas for contributions that took place inside the shared story world, with its content visible to all users, we expected to promote inter-author story awareness. This was partially validated by our evaluation.

Chronoverse's timeline stacked scenes vertically, in up to three lanes, allowing scenes to be placed close in the horizontal axis without much overlapping. Also the splitting of the story into scenes was favorable for the timeline, allowing users to perceive the story progression over time. The provided initial scenes in Chronoverse (described more in depth later) included factions. We chose to use factions as the main actors of the story instead of characters to avoid the problem of author territoriality mentioned in the previous section [12], preventing conflicts and promoting indirect collaboration. Contributors could create their own original characters and integrate them into the story world more easily via faction membership without necessarily conflicting with other authors and their characters. Other potential organizations (e.g., nations, clubs, nobiliary houses) are perfectly valid to achieve the same results. Users could filter the timeline to see scenes that only involve a specific faction, providing a navigational mechanism closely linked to the story world. This mechanism helps in establishing thematic links between scenes created by distinct authors who are not necessarily collaborating directly. We also introduced a pop-up that displays the relationship between the distinct initial factions in a graph.

C. Study structure and settings

As in the previous years, the 2014-2015 Audiovisual Language and Interactive Narrative subject lab took place. We decided to deploy Chronoverse and measure how did it impact on the results. The following phases were planned:

1) Authoring phase: Conduct the lab with the author students, having every group introduce the story plan for their visual novel into Chronoverse over four weeks. Conduct a short questionnaire to rank the usage of Chronoverse, according to its users.
2) Jury evaluation phase: A small jury ranks the contributions, rating coherence and plot/tone consistency. Comparisons include each contribution against each other and each contribution against the initial story.
3) Reader evaluation phase: A larger crowd reads all the stories and ranks their preferred ones. In order to validate the scores from the jury evaluation, they are also guess what stories belong to a common overarching story.

D. Authoring phase

We provided access to Chronoverse to all student groups and asked them to introduce the outline of their stories in it. The goal was to have every group plan their visual novel's plot before writing the final, extended script, encouraging collaboration and convergence. Since the platform was hosted in a public web server, every group could see other groups' work and potentially reference each other directly or indirectly. The resulting story plans, described by the scenes introduced into Chronoverse, would then be adapted into scripts for the visual novels. Ideally, this would allow authors to develop their story in a common frame and influence each other before being tied to the cumbersome work of developing a whole script.

Chronoverse had six initial story scenes (ISS) created by the teachers. The scenes told a single post-apocalyptic story in the university were several factions struggled for power. The first scene explained very vaguely the downfall of civilization for an unknown reason. Each of the following five weeks contained one scene narrating how each of the three fictional student factions attempted to rule the university until a tense and unstable peace is reached in the end. The results section details how the initial story and factions influenced author contributions. The story contained some of the most frequent elements from previous years' contributions, such as a post-apocalyptic world, the students' university, politics and mysterious factions. This story world was very open and purposefully vague, providing flexibility to allow the groups to fully develop their own ideas.

Overall, 22 groups composed by between three and four undergraduates participated. Each group received a textual description of a story world or setting in a brief text document that described the main characters, factions, events and also included some mysteries and "plot hooks" that could be freely developed or used at the authors' discretion. Groups were asked to create at least three scenes in the timeline that represented their visual novel's plot. For every weekly lab and during three weeks, the teacher told them to add at least one scene. This was done to provide groups with enough time to read existing contributions. Reading or even referencing existing material was always optional. No amount of contribution or collaboration was enforced. Three months after the lab sessions ended and each group had produced their

Chronoverse scenes along with the final visual novel, we asked the author students to take a short questionnaire aimed to get some feedback on their user experience. Specifically, we were interested in learning about their opinion on the usage of a default story world and the Chronoverse platform.
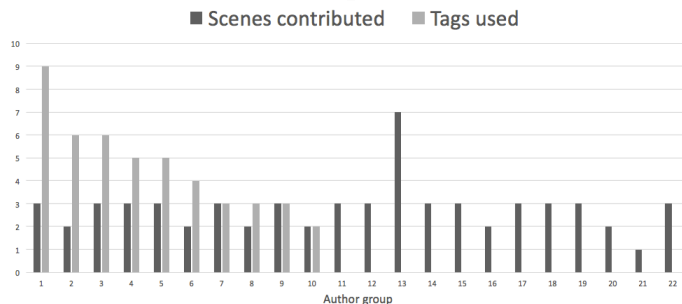
E. Authoring phase results

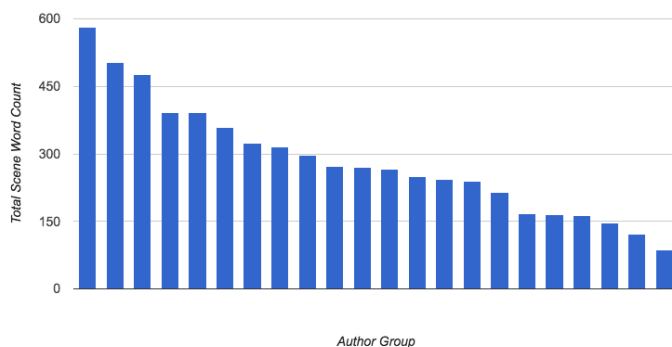Figure 2: Author group scene and tag amount

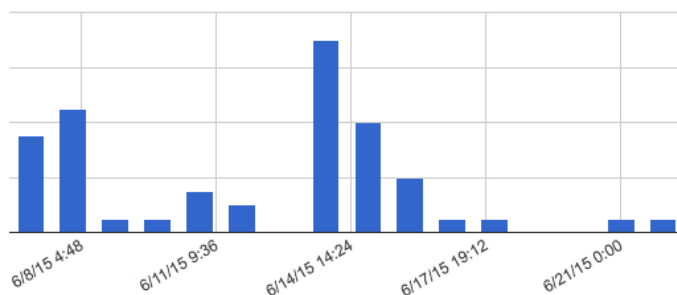Figure 3: Total word count per group

Figure 4: Total scene contributions by date

Table I, Fig. 2 and Fig. 3 show an overview of the results. Groups contributed an average of 2,8 scenes, 2 tags and 283,7 total words. Half of the groups did not use any tag at all and there were a couple of significant outliers (one groups used 9 tags and another group introduced 7 scenes). Fig. 4 shows when author groups introduced scenes into Chronoverse. All

contributions were introduced between the 7th and the 22nd of June. The main contribution peaks are around the lab deadlines (8th and 14th of June).

F. Author questionnaires results

Due to the optional nature of the questionnaire only 17 of the 84 participating authors submitted answers. Results, rated from 1 to 5, are summarized in Tables II and III. Subjects found easy to read and write ($\bar{x}$=3,87 with σ=0,83 and $\bar{x}$=3,59 with σ=1,18 respectively). The provided initial story world (scenes and deliverable text document) scored as moderately useful to write $\bar{x}$=3,65 with σ=0,70, followed by images $\bar{x}$=3,53 with σ=0,68, and finally dates $\bar{x}$=2,76 with σ=1,18. Explicit dates are the less useful and less enjoyed part of the initial story. Some of the open answers provided corroborate this. Amongst all the results from the questionnaire we found a few worth mentioning. 88% of the subjects read some scenes and 12% none. Most of the subjects explicitly were not bothered by contradictions and state they did not influence their writing at all. 94% of the users claimed to have used the initial scenes provided in Chronoverse as inspiration for their contribution.

G. Jury evaluation phase

Once the lab was finished and we gathered all the contributions, we were interested in evaluating the results in terms of consistency and coherence. These measures were meant to determine the integrity of the set of stories as a story world. In order to rate the stories, we created a jury made of three members. Two were teachers who actively designed and supervised the labs and the third was a Ph.D. student who was unfamiliar with the subject or the lab. We were especially interested in determining the relationship between each group's contributions and the initial scenes. Each groups' Chronoverse scenes (previously described) were joined to create an author group scene set (AGSS). The initial scenes created by us were joined into an initial scene set (ISS). The jury ranked every AGSS after the following measures:

- AGSS unitary coherence (is the scene set contributed by the author group coherent?)
- AGSS unitary image coherence (are the images used coherent?)
- AGSS tonal consistency with the ISS (is the author group scene set tonally consistent with the initial scene set from Chronoverse?)
- AGSS plot consistency with the ISS (is the author group scene set consistent with the initial scene set from Chronoverse in terms of plot?)
- AGSS tonal consistency with other AGSSs (is the author group scene set tonally consistent with other authors' scene sets?)
- AGSS plot consistency with other AGSSs (is the author group scene set consistent with other authors' scene sets in terms of plot?)

Coherence of a text referred to the internal logic of its discourse and image. Consistency referred to the text's simi-

larity, in terms of narrative plot and tone, to another text. To ensure the jury evaluation criteria was unified, the measures were discussed informally and we conducted a pre-evaluation with some random Chronoverse contributions. We found no significant differences on the evaluations. Despite the fact that a member of the jury who was not involved in the lab experiment, the criteria for their ranking apparently was uniform. For the main jury evaluation, instead of comparing every AGSS to the rest of the set, each AGSS was compared to the ISS and 6 random AGSSs more. This cut was necessary to reduce the cost of the jury evaluation.

H. Jury evaluation phase results

Results, with the factors evaluated in a 1 to 4 scale, are summarized in Table IV. AGSS unitary plot coherence was somewhat high (average 3,02) while AGSS images were considered coherent with the story created by authors (average 3,45). AGSSs were moderately consistent with the ISS in terms of plot and tone (average 2,55 and 2,89). Inter-AGSS tonal consistency was also moderate (2,44/4) while inter-AGSS plot consistency was low (1,86/4). Next, we run a Pearson correlation analysis on the measures. Specifically, we wanted to find potential AGSS inter-relationships and between the 22 AGSSs and the ISS. The jury's measures of consistency should provide some insight on the collaboration dynamics of the participating groups. The results can be seen in Table V. There is not a significant correlation between AGSS-ISS plot consistency and unitary AGSS coherence, suggesting that adhering to the initial story world elements did not lead to either more or less coherent stories. AGSS unitary coherence was usually high, independently of their consistency with the ISS. There is a significant correlation $(r(N) = 0.63, \rho(N) = 0.002, r^2(N) = 0.4)$ between AGSS-ISS plot consistency and inter-AGSS average plot consistency. The same happens with AGSS-ISS tone consistency and inter-AGSS average tone consistency $(r(N) = 0.62, \rho(N) = 0.002, r^2(N) = 0.4)$. So groups trying to remain consistent with the initial story world in terms of plot and tone scored also high tonal and plot consistency with other author group contributions. It seems that there is also a strong correlation $(r(N) = 0.66, \rho(N) = 0.0008, r^2(N) = 0.4)$ between AGSS-ISS plot consistency and AGSS-ISS tone consistency. Therefore, according to the jury, tonal and plot consistency with the ISS seem to imply each other to some degree. An interesting observation by our jury suggested that AGSS contributions consistent with other AGSSs referenced factions, places and events provided by the ISS, but never elements created by other author groups. AGSSs were ranked as consistent with each other due to their usage of initial ISS elements, not new AGSS elements introduced by other author contributions.

I. Reader evaluation phase

We conducted an evaluation to determine each scene perceived co-existence to the same overarching story and overall preference, according to external readers. We displayed the contributions in pairs and asked whether or not each pair

of displayed texts belonged to the same story. We expected this to reflect the integrity of a hypothetical story world described by the crossover of both stories. Text pairings marked as belonging to the same story would argue in favor of the contributing authors collaborating in a shared story world. 40 volunteers participated in an online questionnaire, with ages ranging from 18 to 63 and a gender distribution of 43% females and 57% males. The volunteers were not author students from the first phase or juries from the second phase. The questionnaire was a simple website we developed using basic HTML and a Django backend. The questionnaire presented 10 pairs of texts, displaying only two at a time. To reduce the cost of the evaluation, pairings included i) the three AGSS that the jury ranked as more consistent with the initial story, ii) the three AGSS ranked as the less consistent with the initial story, and iii) two AGSS set in the middle range. The initial scene set (ISS) was also added to the questionnaire. Each volunteer was asked to rank the stories from 1 to 5 on a Likert scale where 1 meant "I do not like the story" and 5 was "I like the story a lot". We then asked them if paired texts belonged to the same story (only yes or no, closed reply). The simple web questionnaire can be seen in Fig. 5.

Figure 5: Online reader questionnaire

J. Reader evaluation phase results

Table VII shows how what stories were marked by readers as belonging to a common story. AGSSs marked by readers as belonging to the same story than the ISS tended to be also marked as belonging to a common story among each other. This result seems to be in line with our jury evaluation, where AGSSs that were consistent with the ISS were also consistent with each other and once again suggests indirect collaboration.

K. Global results comparison

After conducting the three phases of our study, we can compare each of the AGSSs metrics to each other. This should allow us to validate the distinct evaluations by finding correlations. Table VII summarizes the whole study and contains all the relevant comparisons with the resulting Pearson coefficient. Pearson correlations revealed a moderate correlation between the AGSSs previously ranked by the jury as highly consistent (both, in terms of plot and tone) with the ISS and the tendency to be marked by readers as belonging to the same story

than the ISS ($r(N) = 0.52, \rho(N) = 0.01, r^2(N) = 0.27$ for both cases). This suggest the jury's consistency measures and the reader similarity measures are relatively aligned. There is also a moderate correlation between reader score of the AGGs and AGG-ISS plot consistency and AGG-ISS tone consistency (respectively $r(N)_{rv-pc} = 0.61, \rho(N)_{rv-pc} = 0.002, r^2(N)_{rv-pc} = 0.37$ and $r(N)_{rv-tc} = 0.47, \rho(N)_{rv-tc} = 0.02, r^2(N)_{rv-tc} = 0.22$). Apparently readers liked more stories consistent with the initial story world in terms of plot and tone. There is a moderate correlation between reader score of the AGGSs and tonal consistency with other AGGs ($r(N) = 0.53, \rho(N) = 0.01, r^2(N) = 0.28$). Being tonally consistent with other author contributions was liked by readers (according to the provided scores). Unlike the previous case, this is not extensible to plot consistency. There is a moderate-high correlation between the usage of tags and reader score ($r(N) = 0.54, \rho(N) = 0.001, r^2(N) = 0.29$) and a high correlation between the reader score and the tendency to be marked by readers as belonging to the same story than the ISS ($r(N) = 0.82, \rho(N) = 3\mathrm{e}{-6}, r^2(N) = 0.67$). Also, AGGSs that used more tags revealed high correlations with plot consistency and tone consistency with other AGGSs (respectively $r(N)_{atpc-apc} = 0.78, \rho(N)_{atpc-apc} = 3\mathrm{e}{-5}, r^2(N)_{atpc-apc} = 0.6$ and $r(N)_{attc-atc} = 0.65, \rho(N)_{attc-atc} = 0.001, r^2(N)_{attc-atc} = 0.42$) and the ISS (respectively $r(N)_{atpc-ipc} = 0.92, \rho(N)_{atpc-ipc} = 0, r^2(N)_{atpc-ipc} = 0.84$ and $r(N)_{attc-itc} = 0.77, \rho(N)_{attc-itc} = 2\mathrm{e}{-5}, r^2(N)_{attc-itc} = 0.59$). According to the jury, people contributing closer to other scenes in terms of plot and tone felt more inclined to label their usage of existing character factions with tags.

IV. DISCUSSION

Our goal was to understand better the dynamics of collaborating authors when contributing to a shared story world. Overall, despite giving freedom to our authors, we believe there have been two main outcomes. Some author groups (the majority) have followed and extended the initial story, while others have ignored completely the initial stories and their author colleagues. This means that there is collaboration happening, but it is not the collaboration we were expecting. Author groups that have followed the initial story collaborate indirectly with other author groups that have done the same, creating consistent stories with each other in terms of plot and tone. According to our readers, consistent contributions to Chronoverse are enjoyable and belong to a common shared story. Results have been extensively documented in the previous sections and annex, however there are a few key aspects we believe worth discussing in depth.

A. One story canon

Our main finding implies readers (and perhaps writers) have one single canonical or "official" version of facts. Most authors contributed consistently with the initial story and most readers marked stories consistent to the initial content as belonging

to the same overarching story. Overall, it seems the initial scenes were considered more "official" or canonical than those introduced by the contributing author groups. Contributors seem to embrace the notion of an initial explicit story world and integrate its plot hooks and elements into their own creations. Our authors did not read many of the other authors' contributions and they never explicitly integrated them into their own contributions. The tone, however, was considered consistent between all authors' contributions. Perhaps the initial content, being written by the teachers, was given a special consideration. Maybe timing is the key factor, contributing authors might not feel confident or comfortable referencing and intertwining their content with the unfinished and ongoing contributions of other authors. The sequence in which the contributions occur might be key to determine what parts of the shared story world are perceived as more central or canonical.

This might explain the problems faced by Thomas and Mason [14] in their Wikinovel, with authors colliding as they attempt to impose a main plot structure. When compared to our own research it seems this phenomenon is similar to previous results [20] in which authors converged, establishing a main continuity or central interpretation of the story. The joint conception of a story world might require some information hierarchy, providing new contributors some solid narrative background or baseline from which to start. Information canonicity should be central in any further study of this nature, that is, finding mechanism for authors not only to contribute to a common story world, but also to ensure those ideas are well integrated and accessible. This should make possible that subsequent contributions by other authors are perceived as consistent, something positive for a shared story world according to our own results and by other works on collaborative information spaces [3].

B. Tags and inclusive character groups

The usage of character group or faction tags seems to increase story world consistency. Stories that included tags seem to be more consistent with all the rest of stories in terms of plot and tone. Also stories that used tags have been ranked better by readers. Overall, tags seem to be a good explicit mechanism to structure content in a shared story world. This somewhat implies a benefit in using inclusive groups or categories with an active role in the story contained in a story world (such as the ones found in Chronoverse). Our goal was to avoid author territoriality [12] or the lack of structure in a collaborative environment described by Likarish [13]. This kind of collaborative meta-data, often found in collaborative platforms such as wikis, might be beneficial for integrating original characters from multiple authors while enhancing the global consistency.

C. The usage of Chronoverse

The author questionnaire informal results seem to point towards a positive user experience. The usage of a timeline seems to be favorable for the construction of a shared story world, similarly to some related works [21]. Regarding

other author contributions, authors did not read many other group's contributions before writing and did not care about contradictions. Coping with other authors' stories is apparently not a priority. We believe the authors were fairly motivated students, but this is not necessarily the average user in a shared story world-building scenario. We suspect the most common profile might be one or more professional writers. On one hand, writers might be more proficient at writing stories and building story worlds, potentially being more motivated to contribute more due to the professional background. On the other hand, students might be more open to novel scenarios, such as collaborating in an online platform to build a story world together. Still, we believe replicating the experiment with a professional audience would be paramount to generalize the results to a more common scenario, such as a team of scriptwriters writing a TV show season or a story anthology.

V. CONCLUSIONS AND FUTURE WORK

Our main conclusion from this study is that authors who collaborate in a shared story world are conditioned by the pre-existing material. Contributions are more likely to reference and connect to pre-existing content than to ongoing contributions by other authors. In a shared story world, the sequence of the contributions seems to be critical in establishing information canonicity. Older contributions are more referenced than newer or unfinished ones. Our results and observations also point towards the aptness of timeline visualizations, scene tags and inclusive character factions for collaborative story world building scenarios. There are two main directions for this research to continue, generalizing its findings and extending its applications. On one hand, we are already trying to replicate these observations in a large-scale real scenario, a successful online community that builds and maintains a rich story world. On the other hand, these findings could be used to build a cognitive model or architecture of a collaborative story world.

ACKNOWLEDGMENT

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APPENDIX

TABLE I: AUTHORING PHASE DESCRIPTIVE STATISTICS

	Scenes	Tags Used	Total Word Count
Sample Size:	22	22	22
Mean:	2.81	2.09	283.77
Median	3	0	268
Minimum:	1	0	87
Maximum:	7	9	581

TABLE II: AUTHOR QUESTIONNAIRE RANK QUESTION RESULTS

	Initial story was helpful in writing	Dates helped to write	Images helped in writing	Liked using dates	Liked using images	Reading from Chronoverse was easy	Contributing to Chronoverse was easy
AVG	3,65	2,47	3,53	2,76	3,71	3,87	3,59
STDEV	0,7	1,01	0,99	1,03	1,14	0,24	0,06

TABLE III: DETAILED AUTHOR QUESTIONNAIRE PERCENTAGE QUESTION RESULTS

I read…	1 to 5 existing scenes	5 to 10 existing scenes	No existing scene	
	53%	35%	12%	
My reading order was…	randomly	chronologically	guided by title	guided by images
	33%	27%	33%	7%
I read existing scenes…	before writing	after writing	during the whole experience	
	33%	53%	13%	
Initial story was...	fun	inspiring	typical	
	25%	31%	38%	
Contradictions in the story...	were a minor annoyance	I didn't care	didn't bothered me at all	I liked them
	24%	35%	29%	12%
Those contradictions...	made writing difficult	didn't influence me	inspired me	
	6%	88%	6%	
Wrote our story...	based on existing story world	from scratch		
	94%	6%		

TABLE IV: JURY EVALUATION PHASE RESULTS

	Plot coherence	Image coherence	Plot consistency with other AGSSs	Tone consistency with other AGSSs	Plot consistency with ISS	Tone consistency with ISS
AVG	3,02	3,45	1,86	2,44	2,55	2,89
STDEV	0,87	0,69	0,47	0,56	0,95	0,69

TABLE V: JURY EVALUATION PHASE RESULTS PEARSON CORRELATION COEFFICIENTS

	Plot coherence	Image coherence	Plot consistency with other AGSSs	Tone consistency with other AGSSs	Plot consistency with ISS	Tone consistency with ISS
Plot coherence	1	0,23	-0,01	-0,01	0,09	0,16
Image coherence	0,23	1	-0,16	0,16	-0,3	-0,18
Plot consistency with other AGSSs	-0,01	-0,16	1	0,23	0,63	0,33
Tone consistency with other AGSSs	-0,01	0,16	0,23	1	0,28	0,62
Plot consistency with ISS	0,09	-0,3	0,63	0,28	1	0,66
Tone consistency with ISS	0,16	-0,18	0,33	0,62	0,66	1

TABLE VI: READER EVALUATION PHASE AGSSs DESCRIPTIVE STATISTICS

	Reader Score	Same story than ISS?
Sample Size:	8	8
Mean:	3.10625	0.498125
Median:	3.08	0.52
Minimum:	2.75	0.08
Maximum:	3.4	875

TABLE VII: AGSS/ISS AVERAGE SIMILARITY

Same story?	AGSS1	AGSS2	AGSS3	AGSS4	AGSS5	AGSS6	AGSS7	AGSS8	ISS
AGSS1	1	0,4	1	0	0,22	0	0,4	0,42	0,71
AGSS2	0,4	1	0,3	0,29	0	0,14	0	0,33	0,08
AGSS3	1	0,3	1	0,36	0	0	0,67	0,4	0,88
AGSS4	0	0,29	0,36	1	0,38	0,13	0,6	0,2	0,33
AGSS5	0,22	0	0	0,38	1	0,33	0	0	0,14
AGSS6	0	0,14	0	0,13	0,33	1	0	0,14	0,15
AGSS7	0,4	0	0,67	0,6	0	0	1	1	0,83
AGSS8	0,42	0,33	0,4	0,2	0	0,14	1	1	0,88
ISS	0,71	0,08	0,88	0,33	0,14	0,15	0,83	0,88	1

TABLE VIII: GLOBAL PEARSON CORRELATION COEFFICIENTS PER AUTHOR GROUP

	Reader evaluation phase		Jury evaluation phase						Authoring phase		
	Reader score	Same story than ISS	Plot coherence	Image coherence	Plot consistency with other AGSSs	Tone consistency with other AGSSs	Plot consistency with ISS	Tone consistency with ISS	Average word count	Total word count	Total tags
Reader Score	1										
Same story than ISS	0,27	1									
Plot coherence	-0,16	0,19	1								
Image Coherence	0,35	0,19	-0,08	1							
Plot consistency with other AGSSs	0,37	0,52	0,62	-0,01	1						
Tone consistency with other AGSSs	0,53	0,52	0,04	0,16	0,74	1					
Plot consistency with ISS	0,61	0,47	-0,05	-0,24	0,66	0,82	1				
Tone consistency with ISS	0,47	0,36	-0,03	-0,04	0,64	-0,33	0,06	1			
Average word count	0,21	-0,45	-0,52	-0,04	-0,33	-0,33	0,06	-0,07	1		
Total word count	0,2	0,77	-0,38	-0,14	-0,28	-0,4	0,07	0,73	0,98	1	
Total tags	0,54	0,62	0,14	-0,15	0,78	0,65	0,92	0,77	0,19	0,22	1