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**COMPUTATIONAL SUPPORT FOR GAME MASTERS OF
TABLETOP ROLEPLAYING GAMES**

A thesis submitted in partial satisfaction of the
requirements for the degree of

MASTER OF SCIENCE

in

COMPUTATIONAL MEDIA

by

Devi Acharya

June 2021

The Thesis of Devi Acharya
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2021

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Abstract

Computational Support for Game Masters of Tabletop Roleplaying Games

by

Devi Acharya

In tabletop roleplaying games (TTRPGs), game masters (GMs) facilitate shared story creation using improvisational techniques that let them anticipate and respond to what players want to see in the world. In order to examine the process by which GMs co-create such player-driven narratives, we conduct interviews with GMs about their process preparing for and running TTRPG campaigns. We qualitatively code these interviews in order to synthesize a list of techniques GMs use to move the story forward even when players behave unexpectedly. We then perform a second round of interviews, looking at how GMs would run a specific scenario (*Lost Mine of Phandelver*) and using this as a common baseline for understanding GMing techniques. We also provide GMs with a limited prototype of a digital tool for GMs and use this in our interviews to evaluate what GMs might want to see in a computational assistant. We compare our interview findings to online advice for running *Lost Mine* in order to see if these techniques were shared across a wider sample of GMs. Based on these interviews and analysis, we provide some speculative directions for further designs of computational tools for GMs, such as creating better tools for information visualization and generative content.

Acknowledgments

I would like to give thanks to Dr. Noah Wardrip-Fruin, Dr. Michael Mateas, and Dr. Katherine Isbister, whose guidance was invaluable throughout the research, writing, and review of this thesis. I'd also like to thank my interviewees for their time and insights. Finally, I would like to thank my colleagues, friends and family for their kindness and support. Thank you all for being a part of making this happen.

Chapter 1

Introduction

You sit around your dining room table with a group of friends, nervous but excited to run your first tabletop roleplaying game. Finally everything is ready—character sheets have been made, dice distributed to players, and in your mind (as well as scrawled on note cards and papers behind your game master’s screen) you hold plans for the perfect first scenario. But as the players start talking about what they want to do, you realize there are all sorts of things you hadn’t planned for, in spite of your best efforts. The players may ask questions you don’t have the answers to and want to go places that are merely blank spaces on the map you have laid out in your head. And they’re all looking at you, waiting for a response. What do you do?

Whether game masters (GMs) of tabletop roleplaying games (TTRPGs) are running a pre-authored module or creating an open, handcrafted world for players to explore, they must improvise planned content to fit in with and fulfill players’ goals and desires during play, such as creating new characters, settings, or situations based

on what players want to do and how they deal with the challenges presented to them. Week after week, GMs prepare new content based on the needs of the story in order to create interesting experiences for their players, working this into the story in real time. Through this process, GMs facilitate and co-create a shared story with a large degree of player freedom that features interesting and meaningful choices and interactions for players during play. TTRPG campaigns also have coherence within and across multiple game sessions, featuring recurring characters, raised stakes, and the fulfillment of plot arcs as player characters grow more powerful. The task of facilitating this storymaking is done while still ensuring that players have nearly complete control of their actions in the game world. Because actions are reasoned about and enforced by a human GM, player actions are constrained by the rules of the game system rather than a pre-programmed set of actions that characters can take (as is the case with digital games), and players can add to the content of the world or solve problems in unconventional ways by explaining their course of action to the GM.

The first part of this project is concerned with how GMs facilitate storytelling in their games while still allowing a high degree of player freedom. We are interested in how we can create computational tools to help assist GMs. In order to do this, we must better understand how GMs co-create player-driven stories in an improvisational manner. This thesis presents findings from a qualitative study in which we conduct interviews with GMs about their process preparing for and running tabletop roleplaying games (TTRPGs) with a focus on story improvisation. We then qualitatively code these interviews to compile a list of techniques that GMs use to facilitate storytelling in their

games, as well as areas that GMs struggled with. The GMing process varies depending on many factors, such as whether the GM is running pre-authored content or their own material, and the experience level of the GM. We also compare the techniques that GMs discuss in these interviews to other sources of advice for GMing, such as written advice on how to GM and the advice provided in rulebooks for GMing in order to validate our interview findings. This also provides another dataset that we can analyze in order to better understand the GMing process. We use findings from these analyses to speculate on the potential design of digital tools for assisting GMs.

The second part of this thesis concerns itself with further understanding how GMs run their games grounded in a specific use case. We ask the GMs how they would run introductory module *Lost Mine of Phandelver*, and present them with a prototype of a digital tool that begins to assist with some of the problems GMs might face when running this game. We use insights from these interviews, as well as advice for GMing from other online sources, in order to get insight into how GMs run the module and to assess what features might be helpful in a digital TTRPG assistant. We use this analysis to speculate on further designs for developing a digital assistant for GMs, both based on what GMs need and the techniques that expert GMs use in running their games. Such a tool could help to scaffold the GMing experience for those new to the hobby. This speaks to new directions for computational tools as creative storytelling partners, and how such tools paired with a human storyteller can help to provide a new paradigm for collaborative computational play with digital systems.

1.1 Definition of terms

For this thesis, our discussion of tabletop roleplaying games is primarily focused on TTRPGs such as *Dungeons & Dragons* [49] and similar systems in which one person serves the role of game master (GM), describing the world and roleplaying the world's inhabitants. This GM also provides challenges and story content for players. All other players play as specific characters within the world, defining their own motivations and actions during play.

There exist some TTRPGs that do not have a game master (ex. *The Quiet Year* [11]) or that involve elements other than character-driven storytelling (ex. *Microscope* [54]). While these could also be interesting areas for exploring the use of digital co-creation, these are not the kinds of games being addressed in this thesis.

For this thesis, the terms modules or supplements are used to refer to authored content for TTRPGs beyond what is available in a game systems' core rulebook. The term homebrew refers to rules or content that the GM adds to the game beyond what is provided in game modules or the core rulebook [62].

Finally, the use of the term “we” throughout this thesis is used to acknowledge that this research is a culmination of work done with the help and advising of Dr. Noah Wardrip-Fruin and Dr. Michael Mateas.

Chapter 2

Related Works

Because this work is based on participant interviews towards aiding design, we draw on different research techniques such as ethnographic interviews and requirements analyses. We also analyze work adjacent to this project, such as other tools for human-computer co-creation and other digital support for GMing.

2.1 Interviewing and qualitative analysis

Spradley's *The Ethnographic Interview* describes still-standard techniques for conducting expert interviews [64]. In this book, Spradley discusses different methods for eliciting information from experts when conducting ethnographic interviews in order to capture information based on experts' own experiences—for instance, asking for particular examples of how they might handle a given hypothetical situation. We use this as the basis for developing questions and capturing interview information with GMs to get insights into their process.

Saldaña’s *The Coding Manual for Qualitative Researchers* discusses performing qualitative analysis through first cycle and second cycle coding—tagging small units of meaning within interviews and using these tags to synthesize the overarching themes that emerge. This helps the researcher better understand interview content, compare similar and dissimilar information across interviews, and derive more general insights based on specific information by grouping codes into categories [58]. We use this as a basis for qualitative analysis of our interviews in order to better understand the data gathered, pulling out the difficulties GMs face and the different techniques they use to help mitigate these problems.

The interview questions and codes created for the two rounds of interviews in this project are discussed further below in the methods for each section (3.1, 4.1.3).

2.2 Requirements analyses

Interview insights can help to inform the design of digital tools in requirements analysis work such as the work of Nelson and Mateas [51] and Grow et al. [29]. These researchers create iterative designs and conduct interviews with potential end users in order to shape the design and functionality of the tools they are creating. Nelson and Mateas provide game design assistive tools to several groups of game designers with various needs in the design and production process. The researchers then perform interviews with these designers about their needs and how they can use the tools provided to help with the design process, iterating on the tool’s design based on the results of

these interviews [51].

Grow et al's approach to evaluating AI architecture authoring tools is similar, using three different case studies to evaluate three different architectures, and looking at how different architectures require different methods of authoring. This means that the authoring solutions are tightly bound to each specific case. They use iterative interviews to determine the differences between authoring for specific architectures, using insights from these interviews to evaluate the design of various authoring tools [29].

Interviews can also be used to analyze player experiences and provide qualitative and quantitative backing to software design. Gustafsson, Holme, and Mackay analyze the play experiences and players' stories of important objects from their play using interviews and questionnaires. They also solicit and find stories of players narrativizing their online gaming experiences. Analyses of these stories are used in order to inform the design of new game architectures that provide a greater support for player narratives [30]. Like this study, we use a triangulation approach [47], combining our interviews with analyses of other sources on advice for GMs (Section 4.3) in order to better balance the trade-offs in our methodological approaches. Other alternatives to understanding interviewees' experiences include focus groups, which can be used to assess individual features of a design as well as a group's general understanding of it [25].

2.3 Interviews analyzing TTRPG play

Researchers have also used interviews and qualitative analysis to analyze play of TTRPGs, similar to the work in this thesis. Brace uses interviews as part of a broad ethnographic study on roleplaying, discussing the social dynamics and player experiences within TTRPGs [17]. Other researchers use interviews in order to better understand the GMing process. Tychsen et al. use interviews with participants along with surveys and recordings of play sessions to analyze how GMs use waypoints to guide the players through the game and how the final playthrough of a game might vary from the pre-planned story [73]. Flowers et al. also interviewed GMs and coded those interviews in order to develop a list of GMing techniques categorized into attractors and detractors to help incentivize players to act as desired while discouraging players from unwanted behaviors [28].

These studies, particularly [73] and [28] are similar to this one both in terms of the methods used and the goal of better understanding GMing. Some of the findings in these papers such as GMs needing to be flexible and change plans during play [73] and GMs wanting to incorporate players' wishes into the game and motivate them [28] agreed with what we found in our interviews and analysis of advice for GMs. However, unlike those papers, we focus in this thesis on GM techniques for improvisational storytelling and compare techniques we found to other sources of advice for GMing.

We note that other works analyze TTRPG play in order to apply techniques learned from this analysis to the domain of digital games, such as creating more personal-

ized play experiences in Massively Multiplayer Online Role Playing Games (MMORPGs) [74] or creating a digital game master [45] [18]. While these are helpful in understanding other applications for GMing techniques, here we are interested in how we can use computational tools to assist GMs and scaffold the GMing experience, rather than replacing the GM or applying these techniques to purely digital systems.

2.4 Advice for GMs

Existing advice on GMing from both TTRPG rulebooks and other supplementary material can help serve as another way to understand the techniques involved in the process of GMing and how we might design and build digital tools to help support this process. Analyzing this advice can help us to understand the challenges that GMs might face and how they tackle these challenges. With the rise of popularity of *Dungeons & Dragons* (*D&D*), many GMs (including some of the GMs interviewed) have their first experiences learning how to GM while learning from the latest edition's (5th edition) rulebooks. Some of the introductory texts to GMing that many new GMs start with thus include the *Dungeon Master's Guide* [49] and the introductory kit for 5th edition, the *Starter Set* [9].

The *Dungeon Master's Guide* [49] is a guide for GMs to help them create a world and campaign, discussing how to align the rules of the game to the GM's preferred style. For those completely new to GMing, the *Starter Set* [9] serves as an introductory guide with guidance on how to play and features an introductory module that the GM

can run, *Lost Mine of Phandelver*. Below (Section 3.3), we discuss the advice that these sources present to GMs, and how that might compare to or differ from the techniques that interviewees have used in running their own games.

We also examine advice from *Unframed: The Art of Improvisation for Game Masters* [53]. This book features twenty-two essays from prominent TTRPG designers and GMs on tips for improvisation. In these essays, the writers discuss the importance of improvisation in running TTRPGs and their techniques for GMing while building the story based around the actions of players. We compare the advice both in the game guides and the essays to the results of our interviews below (Section 3.3). We also look at online advice including blog posts and forums for how GMs can prepare for and run *Lost Mine of Phandelver*, and compare this to interviews with GMs about the module. This provides insights about a greater variety of techniques that GMs use and the advice that those who have run the game would give to other GMs, especially those who are new to GMing. It also helps us see some of the problems GMs might face in running games and how to circumvent some of these problems.

2.5 Creativity support tools and mixed-initiative story construction

We are interested in how computational tools might help to assist GMs in the GMing process. This aligns well with the domain of creativity support tools and mixed-initiative systems. Yannakakis defines mixed-initiative co-creative systems as systems

where human makers and computational systems each work together to make something that might not have been created by either agent without this collaborative process [78]. They evaluate a particular co-creative design based on designing and editing strategy game levels. Kreminski discusses generative games and how they can be used by players to help construct and retell stories of gameplay events, and how this process can help players overcome many barriers to creativity, such as “fear of the blank canvas” or “writer’s block” that might affect creators who are just working on their own [44]. They explore this process through examining player retellings of gameplay experiences, and how players work together with generative systems to build up experiences that can be retold as interesting stories.

Compton and Mateas’s [19] work on casual creators and Samuel’s [60] dissertation also discuss how people can work together with computational tools for creating new artifacts. Compton and Mateas [19] describe “casual creators,” tools that provide a low barrier to entry for users to explore and make in a creative space. Samuel [60] discusses works of “shared authorship,” created through the process of a human working with a computational system to collaboratively create a narrative artifact. This project is interested in creating digital tools in the same vein as this, with a person working in tandem with a digital system to create a new creative product.

There are several existing research projects that tackle similar goals to this project, supporting human-computer collaborative story construction. Although these are not specifically built for assisting with TTRPGs, we can use them to help understand how existing mixed-initiative story construction systems work. One such example is *Bad*

News [59], an experience in which participants interact with a social simulation. The player plays the role of the mortician’s assistant, searching a small town to identify a dead body and deliver the news of that person’s death to the next of kin. The player describes what they want to do, which leads to a “wizard” making changes to the simulation via live coding. The wizard can then send updates to the actor playing the role of various NPCs in the town, and the player can interact with the actor to get more information. The wizard can also surface up other interesting information about the procedurally generated town, and feed that information to the actor. Although this is not a TTRPG, it provides a similar dynamic (with an actor taking on the role of NPCs within the town, and a player exploring the space) and the authors describe their ideal player as open to “improvisational roleplay” [59].

The Cozy Mystery Construction Kit [42] presents prototyping for a story construction game in which two players create a mystery story together alongside a computational system that offers a social simulation of characters, their relationships, and their motivations. In this project, the human players take on asymmetrical roles, with one playing the role of the “Agatha player” who is concerned with shaping the higher-level story and plot goals, and the other taking on the role of the “detective player,” who is more concerned with individual characters’ actions. The computational system procedurally generates a simulated cast, keeps track of what has happened so far, and provides suggestions for what can happen next. The players interact with the system and each other in a loop of deciding goals, actions, and working with system suggestions to create a coherent mystery story. Like *Bad News*, this project supports similar

experiences to the ones that we want to support.

2.6 Existing digital tools for helping run TTRPGs

Currently there exist many different digital commercial and research tools for helping run TTRPGs. Some tools exist to help keep track of information, such as providing reference materials for rules and elements in the game (for example, a list of spells). Others exist as generators, to help provide content for the game, such as random generators for names or maps. Certain online platforms for running TTRPGs also exist as a shared digital space where the players and the GM can access the same information through a shared visualization, for instance the locations of player characters and enemies on a map [7]. While these are not fulfilling the same functionality that this thesis describes, they show that digital tools can be helpful and welcomed in the TTRPG space.

Researchers have also worked on developing digital tools for TTRPGs. One example of a digital tool used to manage information is *Undercurrents*, a tool that helps to facilitate hidden information communication by helping the GM share information with only a single or a few players [15]. The GM has access to an interface in which they can type and send messages, selecting the players to receive the messages. This serves both to relay information and serves in some capacity as a log of what has happened, maintaining the history of messages that have been sent between players. This helps maintain hidden information in what is traditionally an open space of information, and

provides a way of keeping track of what has happened in the game so far.

An example of a tool using procedural generation in order to create content for TTRPGs is *Imaginarium*, which uses procedural text generation to provide descriptions that are constrained by the author but still have variations to them, using an authoring language similar to natural language [34]. Horswill uses the example of generating various kinds of cats; the user specifies properties, constraints between properties, and a taxonomy of different types of cats and the system generates random cats satisfying these constraints. He poses this as a casual authoring tool for GMs to develop semi-randomized content on the fly, for instance descriptions of monsters.

There has been some exploration of examining the storytelling techniques within TTRPGs [28] [21] and theorization of how one might build digital tools based on these techniques [13] [52], but as far as we have found, there are no finished digital tools that focus on helping to facilitate collaborative storytelling in TTRPGs.

Chapter 3

Understanding the GMing Process

In this part of the thesis, we are interested in understanding GMing techniques through interviews with GMs. Here we discuss our interview methods, the findings from these interviews, and how we can use these findings towards understanding how we might design a digital assistant for GMs.

3.1 Methods

We interviewed seven GMs with varying levels of expertise running TTRPG campaigns ranging from several months to several decades of experience. These GMs have run games using different existing or homebrew game systems and have run or are currently running a TTRPG campaign as of the time of the interviews. Interviewees marked as having a low level of experience in Table 3.1 have run several sessions of a single campaign, while those marked as having a high level of experience have run many different campaigns. Participants in Table 3.1 are ordered in a rough approximation of

Participant #	Experience Level	Game Systems
1	Low	Dungeons & Dragons 5e homebrew
2	Low	Dungeons & Dragons 5e homebrew
3	Low	Dungeons & Dragons 5e homebrew
4	High	Dungeons & Dragons 5e modules, homebrew
5	High	<i>The Burning Wheel, Mouse Guard, Blades in the Dark</i>
6	High	Homebrew
7	High	<i>13th Age, Unknown Armies</i>

Table 3.1: A list of interviewees from the first round of interviews, their experience level running TTRPGs, and the TTRPG systems that they have run in the past

their level of experience.

Participants were selected via convenience sampling [55] from the population of graduate students and faculty in the nearby area, utilizing a network of individuals who know others that run TTRPGs. Part of the criteria for selection was based on choosing participants with varying levels of experience running TTRPGs. We conducted interviews either in-person or via phone call for non-local GMs. Interviewees were contacted via email, told about the premise of this project (interviews towards understanding how GMs facilitate storytelling in tabletop roleplaying games) and were asked if they would like to participate in an hour-long interview about their process. Interviews were recorded with permission of the interviewee.

Interviews were semi-structured, consisting of a series of prepared questions, with follow-up questions and requests for elaboration depending on topics the GM cov-

ered in their interview relevant to our research topic. Questions covered the interviewee's background, their work preparing for games, how they run games, and how they deal with storytelling in their games. Some examples of prepared questions include:

- How long have you been running TTRPGs?
- Tell me about the story of a campaign that you are running or have run in the past.
- How do you typically prepare for running a campaign? How much do you plan out in advance?
- How do you typically prepare for each individual session? Do you plan out specific events?
- How do you prepare for running pre-written campaigns? Is this different than your process for running homebrew campaigns? If so, how is this different?
- Tell me about a time when something unexpected happened that caused you to have to improvise new content. How did you deal with this situation? What was difficult for you in this process?
- In what ways do players influence the story of the campaign either before or during play?

Follow-up questions and clarification focused on getting more information on a specific GM's techniques and how they deal with issues that arise during play, including asking for specific examples illustrating the concepts that they discussed.

Using notes from the interviews as well as recorded interview audio, we then performed first cycle qualitative coding on each interview. We primarily used “descriptive” and “process” codes in order to analyze the techniques that GMs use in preparing for and running their games [58]. We developed a list of codes based on this interview analysis, adding a new one to the list whenever a topic or process arose that had not previously been mentioned. We also marked specific examples of moments that arose during play that illustrate specific techniques. We used these codes in order to develop broader categories of which each of the codes are a part. Examples of these codes and general categories can be seen in Table 3.2. We also used these codes and general categories to capture the similarities and differences in how GMs approach a particular problem in preparing for and running their games.

While these interviews offer a depth and detail about the play experience and allow us to talk through the process and specific examples with GMs, they are also limited in scope, describing the experiences of a small number of people. Because of this, we also analyze other sources of advice on GMing in order to better understand the GMing process. By looking at advice for GMs, offered both by rulebooks and other experts, we can better understand the context by which GMs might learn to GM (by looking at advice for new GMs offered by sourcebooks) and better understand how experts might codify their process in order to teach others how to GM.

General category	Category description	Examples of codes in this category
GM Problems / Wants	Problems that arose for GMs during play, or things that they would like to see from a computational assistant	Pacing, Player vs module, Keeping track, Player downtime, GM busy during play, Time to prepare
Running games	Techniques that GMs use while running their games	Immersion, Incorporating players, Player-driven solutions, Onboarding, GM vs player reality, Inducing emotion, Player consequences
Preparing for games	Techniques that GMs use when preparing content for an upcoming session or section of the campaign	NPCs, Encounters, World, GM Intention, Story structure
Examples / Stories within campaigns	Specific examples during play that highlight how the GM uses techniques	Player consequences, Surprise, World as agent, Player motivation, Keeping players on track
Background / History of GMing	Information about the GM's background, game systems that they've run, general information about TTRPGs and their design	GM style, Game systems, Homebrew, Background, Recommendations for GMs, Experience

Table 3.2: A list of codes and categories created from analyzing interview content

3.2 Interview results

From these interviews, we found the following insights about how GMs prepare for and run their games, specifically focusing on techniques that they use in facilitating player-driven storytelling in their games. These insights are categorized into relevant sections based on the high-level goals of the topics discussed. They also include specific examples of moments in gameplay that GMs gave when talking about games that they've run in the past. Each technique is attributed to a particular GM or set of GMs who mentioned this in their interview, with the relevant GM's interviewee number in parentheses (as corresponds to the interviewee number in Table 3.1). A quantitative breakdown of each of these sections (stating the interviewees who discussed given techniques) can be seen in Table 3.3.

3.2.1 Player investment

One area GMs discussed was the importance of getting players into the game and keeping their attention during play. The GM often introduces players to the game's world and becomes the expert on that world, giving this information to the players as they explore and inhabit it. Interviewee #2 states that they as a GM want the players to have the same "visceral" reaction to the world as they do, but they worry that their players might feel at a loss as to what the world has to offer and why they are acting in the world. Creating a means for players to get and stay invested in the game can help to mitigate this.

Category of technique	Technique	Participants who discussed technique (by participant #)
Player investment	Using character sheets to understand what players want to see	5, 7
Player investment	Building personal relationships to NPCs	2, 4
Player investment	Managing player attention	5, 7
Player agency and consequences	World with momentum	6
Player agency and consequences	Continuing story by thinking through logic of world	3, 6
Managing planned content	Planned story structure	3, 4, 5, 6
Managing planned content	Story based on movement between locations	3, 6
Managing planned content	Random tables	5
Managing planned content	Planned modular encounters	4, 6

Table 3.3: Categories of GMing techniques and participants who discuss using this technique

One way in which GMs get players invested in their games is by figuring out what players want to see in their games and providing more of this. Two GMs (5, 7) talk about using the character sheet as a reflection of what players want to see in the world. While character sheets provide some content that would naturally lend itself to introduction into the story, such as the character’s backstory, personality, or goals, GMs also talk about how player attributes can help to determine the kinds of actions that a player might be interested in taking in the world. For instance, if a player chooses to invest points in skills pertaining to sneaking, they likely want to encounter situations where they can have the opportunity for a stealthy approach to problems in order to show off their abilities in this area. Interviewee #5 said that interpreting player intentions through their character sheets could also have complications. For instance, if a player chooses to have a high dexterity attribute, it could be because they enjoy and want to encounter many dexterity-based challenges (such as lockpicking). It could also mean the opposite, though—maybe the player doesn’t want to deal with these kinds of challenges, and chooses to keep this attribute high so they have near-guaranteed success at these challenges and thus don’t have to deal with them.

Another way to encourage player investment in the game is by building up personal connections between players and the non-playable characters (NPCs) of the world. Interviewees #2 and #4 talk about this, discussing the difficulties motivating players to follow the plot of a module, or giving players a reason why they are acting in the ways that they are. By creating NPCs that players (and player characters) are attached to, though, it is much easier to get player buy-in and give them a “why” for

their actions. Players are more inclined to want to perform tasks that help out particular friendly NPCs because they are friends, and this personal connection helps to solidify the player's place in the game world as affiliated with (or enemies of) particular characters and factions.

Finally, interviewees #5 and #7 talk about managing player attention at the table in order to keep players invested in the game during play. Interviewee #7 discusses helping keep players invested in the game by introducing two parallel storylines in which players divide up, with some players in one group and some players in the other. Both groups have different tasks to accomplish, but the success of one group is contingent on the success of the other. Each cross-cut between the storylines ends in a "micro-cliffhanger," and thus each group of players, even the group not directly in the spotlight, is invested in both what's happening with their allies and what will happen next to them.

3.2.2 Player agency and consequences

Another area that GMs discussed was giving players a sense of control over the world and making them feel like their actions have consequences. One way in which interviewee #6 helps to give players control is by creating a game world that has "momentum." For her, this means that the world and its agents are headed in a particular direction, and events will play out in a certain way. The players can choose to intervene in the world, though, and change the trajectory of events for those in the world. She gives an example from one campaign she ran in which a group of NPCs were trying to stage a revolution against the authoritarian governing power. Regardless

of the players' actions, the NPCs would attempt to lead a rebellion, which without intervention would be destined to fail. If the players choose to help, though, they could potentially steer the rebellion towards success. This gives the players a feeling of being able to exercise power over the world, and makes it clear that their choices matter. Because of this momentum, both player action and inaction have consequences. This GM (6) describes that when players choose to perform actions that are away from the main storyline, the world continues on without them. They might hear updates from those they have left behind, and the parts of the world that the players have left do not stay static until the players' return. This can help steer the players back towards the main storyline, but also emphasizes the fact that even inaction or engagement with other content is a choice that has consequences that affect the rest of the world.

GMs (3, 6) also present players with the consequences of their actions by thinking out logically what might happen as a result of player actions. One GM (3) gives an example of how he might play things out if the players decide to rush off to try to kill the antagonist of the game, even if he wasn't expecting or prepared for the players to do so. He describes what his thought process might look like in such a circumstance—he would think through what's going on in the antagonist's life, where they should be at the time that the players attack, what their weaknesses are, how the players can exploit those weaknesses, and who would take over if the players killed them. By thinking through the logic of the world, the GM can determine consequences for actions, even for player actions that are unexpected or unaccounted for.

3.2.3 Managing planned content

A third area that GMs discussed when talking about how they facilitate storytelling in their games is managing planned content. All GMs discussed doing some level of preparation for their campaigns and individual sessions such as planning out particular story events, encounters, lists of characters and locations, and other content. They discussed their process for creating planned content while working around the fact that players are unpredictable and might not want to follow the path that GMs have planned for them.

Some GMs (3, 4, 5, 6) talked about having a planned story structure for their games, discussing how they plan out the story in general, with particular story beats that they want to happen, but much of the story still driven by the players. One way in which some GMs (3, 6) handle this is by structuring story progression in terms of movement between locations rather than movement in time. Interviewee #6 discusses this in particular, explaining how she begins one of her games in a small neighborhood that might have some local problems going on that the players can help with. This starting neighborhood has several different “calls to action,” she states, but although she’s not sure which one players will take, they will engage with this first area, and then things can expand organically. As players explore more, they go to new, bigger areas, meet new factions, and are given new paths in the story to follow. This expanding outward helps to limit player overload, says the interviewee, and lets the GM trace out story content through these locations.

Another example of planned content is planning encounters, letting the GM figure out what they want to happen in any particular session while still allowing for a large degree of flexibility to account for what players want to do. One interviewee (5) describes how he relies on randomness and procedural generation to help him create relevant encounters during play. He describes planning the content for this more as a kind of “meta-prep,” in which he lays out the “possibilities” of the world rather than what players will find at a certain location. Instead, he describes the world in terms of what one might find or would be likely to find, rather than what is definitively there, using randomness as a “serendipity engine” for interesting outcomes. He describes the experience of play in this as his setting up the “world skeleton,” and letting the players “wander around and find the details.”

Another example of planning encounters is creating content that is more modular, as described by interviewees #4 and #6. Interviewee #6 provides a specific example of this, describing how she plans out general encounters that are thematic and can be slotted in at the appropriate time as needed. For instance, she describes when preparing for a game that she would put together the information for and a list of creatures that the players may encounter if at the moment she needs something such as a “creepy” encounter, or a combat-oriented encounter. This way, content isn’t planned out in a linear fashion and the GM can call upon whatever she has prepared based on what is needed at the time, responding to player actions.

3.2.4 Comparing novice and expert GM techniques

Through these interviews, we can also look at the differences between techniques and problems that novice GMs mentioned compared to those discussed by experts. This can provide insight into the differences in skills and needs between these two groups.

3.2.4.1 Improvisation

In general, novice GMs tended to stick to pre-planned or scripted material more, and struggled more with being able to manage players that did something unexpected. This could be a disconnect between what the GM and players expected the characters to be doing, or a larger disconnect about the tone or theming of the game and what the players expected to play (1, 2). Participant #2 describes their experience running module *Curse of Strahd* [70] as becoming “railroady” at times, as there are “certain things that need to happen” that aren’t always conducive to what the players do. They describe the process of GMing as being “like herding cats” and described being greatly helped in this process by players who understand the GM’s hints and help persuade the rest of the party to go along with these plans.

In contrast, many expert GMs saw improvisation in games not as a challenge to overcome, but as part of the benefit of the TTRPG experience. One GM described the process of improvising around what players want to do as the “entire reason I play the game” (5). These GMs still sometimes offered deterrents for players to disincentivize them from going to unplanned places or deviating from the main story. One GM, for

example, describes a colorful story of presenting players with a “waterfall of poop” (6) to disincentivize them from going in the sewers. However, when players choose to proceed into areas or take actions that are not necessarily planned by the GM, expert GMs seemed more comfortable improvising around player actions and creating new story content for players. In the example above of the players trying to enter the sewers, the players decided to pursue their course into the sewers anyway and the GM describes how she thought through what they might find down there based on the layout of the city and the subplots going on, laying out new locations and encounters for them rather than solely focusing on keeping players on track. This improvisation by expert GMs can also be seen in reducing the amount of planning that goes into preparation for a session. For example GM #5 states that they like to “improvise as much as possible” when running a game, not usually running pre-written scenarios because it is easier to make it up along the way. Improvisation may be easier for expert GMs because of different factors—more experience and ease with running games, preparing for games, or running games that are not directly from pre-written modules.

3.2.4.2 Game systems and GM style

For the group of GMs that we interviewed, expert GMs had been exposed to a greater variety of roleplaying game systems and had more experience playing with and running a variety of different systems. They discussed drawing on this variety of sources as part of their process (5, 6, 7), in one case (7) even using different game systems within one game in order to create a variety of experiences for players, and introducing them

to material they might recognize even as experienced TTRPG players. Furthermore, GMs (5, 6, 7) discussed how different game systems they have used beyond *Dungeons & Dragons* are created to counter some of the elements that might be seen as problems in *D&D*'s systems. In contrast, those with little experience GMing had primarily only been exposed to *D&D*. When they did discuss drawing material from other sources, these were generally related to *D&D*—for instance, podcasts or example scenarios that use this game system.

This exposure to a variety of different sourcebooks or materials, as well as running a greater variety of kinds of games, could potentially help expose experts to more advice for running games as well as different styles of TTRPGs that influence the way that they run their games. For example, GMs talk about how systems like *The Burning Wheel* [22] (5) or *Unknown Armies* [66] (7) have “expressive” (7) character sheets, where much of who the characters are is defined by the player and part of the character sheet, rather than just a collection of statistics. These GMs like this integration and incorporate it into their own games. The skills needed to adapt to new game systems could potentially help increase a GM’s flexibility in adapting during play as well.

3.3 Comparison to GMing advice

We examined sources that offer advice for GMing in order to compare these to the results of our interviews. This allowed us to explore more of the context for GMing

(for instance, how beginner GMs might be advised on how to GM) and see how written advice on how to GM had similarities or differences with our interview findings.

The *Starter Set*'s pre-written module for beginner groups is *Lost Mine of Phandelver*, a multi-part adventure that leads the party to seek out a lost mine supposedly filled with riches while potentially drawing the ire of others seeking to claim the treasure for themselves [9]. The module begins by explaining the role of the GM as referee, narrator, and the one who plays the part of monsters and NPCs in the game world. As the narrator, the GM serves as the “interface” [9] between the players and the game world, setting the pace of the story, providing challenges for the players to overcome, and describing what happens in the world based on characters' actions. The adventure describes the game as a shared story, advising GMs to let the players contribute to the story through their actions. *Lost Mine* also gives general suggestions that GMs can use to build the story and provide players with information. For example, the text provides lists of information that NPCs might know, offers advice for roleplaying NPCs as having their own lives and goals, and introduces events (such as the players being attacked by antagonistic forces) that the GM can use to incite conflict and move the story along as needed. Although the guide does provide some advice on how to change the story based on the player's actions, certain parts of the story are still predicated on the players having taken some previous actions. For instance, the module allows players to follow up on whichever plot hooks they found in the town of Phandalin once they move to the next part of the story, but this is based on the assumption that the players visited Phandalin and got information from the residents there. While the adventure

sets up some interesting encounters and some conditional information based on player actions (for instance, alerting the guards in an adjacent room if the players make too much noise) it provides little in the way of advice regarding larger improvisation within the story. In some cases it reminds GMs of problems—for instance, warning them that players will have trouble in Wave Echo Cave if they skipped too many of the optional encounters in earlier sections and are thus underleveled—but provides little in the way of helping GMs circumvent these problems during play.

The *Dungeon Master's Guide* provides more in-depth advice for GMing, but does not focus on how to GM any particular module [49]. Instead, it provides examples of different play styles GMs might want to use in their games (from “hack and slash” to “immersive storytelling” to “something in between”) and then discusses elements of creating adventures for players. Some of these “elements of a great adventure” include providing players with a credible threat, providing tropes that have a twist to them, focusing on the present situation, letting the players be heroes that matter, and providing surprises for players. The book then provides advice for setting up adventures depending on the kind of adventure the GM wants to run. For instance, if they want to run an adventure based on a particular location, the book recommends first establishing the party’s goals, then identifying important NPCs, fleshing out the details of the location, figuring out a good introduction for the adventure, coming up with an ideal climax, and finally planning out encounters affixed to particular locations on a map. Planning a mystery adventure looks different, with the GM planning out a victim, suspects, and clues that point to the identity of the villain. The book then provides tips on introduc-

ing complications such as quandaries for players, twists to the story, and encounters for the players to overcome.

Some of the GMing advice presented in the *Dungeon Master's Guide* and the *Starter Set* fits in well to what we found GMs were doing during play in our interviews. One example of this is that the *Dungeon Master's Guide* discusses that part of planning an event-based adventure involves the GM anticipating the villain's reactions to the players, laying out how those villains might react to the various actions the players take. For instance, the guide suggests that the GM could use a timeline or flowchart to map out how the villain's actions might change as the game progresses and in response to players. This is similar to how the GMs interviewed think through the logic of player consequences and adapt the world to the actions that the players take. The book also recommends pulling on player characters' ideals, bonds, and flaws (various elements of the character's personality and what is important to them), as well as drawing on tensions between character goals or interpersonal relationships in order to provide interesting dilemmas for players. This is similar to how interview participants discuss their experiences using character sheets to inform the challenges they provide to players. It also emphasizes the importance of the relationships between NPCs and players during play which also came out in our interviews.

While these sources do discuss some advice for improvisation, such as gestural elements (using different voices or expression with one's face and arms in playing out characters) or coming up with responses to player actions during combat (for instance, determining damage from players using objects in the environment to attack monsters),

these texts do little to discuss improvisation around adding to the story during play. While the rulebooks do encourage GMs to improvise or make things up during play, and provide some guidance on how to do this (for instance, rolling up random encounters based on a table), they also assume some level of player buy-in and cooperation when it comes to running a game. For instance, both assume a clear, planned beginning, middle, and end for the story, with players exploring the story and making choices within it. They, however, don't talk much about what to do when players inadvertently kill the villain of the story towards the beginning of the game, or if players skip over a section of the game and lose out on essential information needed to continue—both experiences that interviewed GMs faced in their own games. These are the same areas in which we saw novice GMs struggle.

Another source of advice to look at is how experts give advice to other GMs on how to run their games. For this, we looked at the essays in *Unframed* [53] which describe techniques that GMs or TTRPG designers recommend GMs use to help them better improvise in TTRPGs. Similar to the expert interviews we conducted, these provide some detail on how GMs describe and codify the act of GMing, helping us to better understand (and design for) these processes. This also helps to provide another set of data alongside our interview data to get a broader view on GMing.

Many of the techniques discussed in these essays were similar to ones we found in our interviews. For example, in our interviews, interviewees emphasized the importance of using character sheets and players' discussions to influence what should appear in the game. Similarly, several of the authors discussed these elements in their essays.

Boss states that “In roleplaying, we use our character sheets and world write-ups to create the circle of expectations that help us navigate creative channels together” [16]. She describes how character sheets and other elements established about the world create a shared understanding of what can (and cannot) happen within it, from which the story can be developed. Schneider also recommends that GMs draw from character sheets as inspiration for adding to the story, asking, “Has anyone taken an unusual skill or ability, but not used it yet? How could you create a situation in which they could use it?” [61]. Authors also discuss how players can be a part of the worldbuilding process and how GMs can use what the players want to see to shape the story. Martin talks about this as part of the preparation process for the game, where players can collectively establish facts about the game world to “build the world’s history together” [61]. In this process, each player becomes something of an expert over some part of the story with which they have established a connection [61]. Hartley also talks about listening to players to get a sense of what they want to see. For example, if players are asking around for more social interactions or looking for something to fight, the GM can provide these kinds of encounters [33]. This removes some of the burden of content creation from GMs as they can draw inspiration from their players, and allows them to create play experiences that fit with what the players want.

Another recurring theme that arose in our interviews and in the essays was planning and creating content based around the need for improvisation. Arcadian discusses the need for GMs to relinquish “strict and rigid approaches to storytelling,” stating that this doesn’t work in a collaborative storytelling environment [12]. Instead

he advocates for what he calls the “Island Design Theory,” in which “the plot points, encounters, leads, clues, and other important components of the game” are broken down into “simple, independent pieces with multiple ways into and out of each piece” [12]. These pieces are then loosely grouped together in a way that lets players “navigate from island to island” without a set order, instead allowing players to “make their own connections... they put together their own story out of the elements you provide” [12]. This modular content allows the players to have more control, with paths through the story largely influenced by players’ choices and actions. Vecchione also describes his approach to eschewing a fixed story, describing his campaigns as “collections of interesting NPCs and conflicts” [77]. While he might start a session with some idea of its general direction, he states that “What actually happens in that session will emerge through play. The story volleys back and forth among the three of us, being created layer upon layer” [77]. He emphasizes the importance of the players in story creation and finding the direction of the story through play. Story management based on improvised storytelling is important too—Jacquays describes this process, describing how parts of the story are planned but allow for flexibility, such as allowing the locations of events that need to happen “to slide around to be convenient to the flow of the adventure” [37].

The authors of these essays, like the expert GMs interviewed, also discussed the joys of improvisation in TTRPGs. For instance, Hartley states that in TTRPGs “There’s no way to avoid players going in directions you’d not anticipated, or reacting in ways you could have never expected. It’s not a flaw in your game—it’s one of the joys of roleplaying” [33]. It makes sense that the authors of this series of essays dedicated to

tips for improvisational GMing would speak on the pleasures of improvisation as part of the roleplaying process. This is something we also saw from our expert interviewees. We also saw in both cases GMs discussing drawing from a variety of sources (either many kinds of game systems or other reference documents) as a base for inspiration in their own games [37] [75] [77]. Expert GMs, having gained more experience with improvisation as well as greater exposure to different systems and advice for GMing, find improvisation an easier and more rewarding part of the GMing experience.

3.4 Discussion

Analyzing these interviews allows us to gain insights into the techniques that both novice and experienced GMs use in facilitating storytelling in their games and the difficulties that they face in this task. A good deal of the techniques that GMs discussed were based around shared storytelling that focuses on developing the game world around who the player characters are and the actions that they take. This is done both in planning—GMs discussed planning modular content that can be slotted into the game as needed, or meta-prep such as designing random encounter tables—and during the real-time play of the game. Both beginner and expert GMs discussed thinking through the logical consequences of players' actions in order to continue the story if the players did something unexpected, which requires the GM to improvise around these unexpected actions. Other techniques discussed by expert GMs focused on emphasizing the importance of player actions and developing the story around them as integral to

their gameplay, such as creating challenges suited to player characters' skill sets and changing the game world based on the results of players' chosen actions and inactions. Because of this, we find that improvisation, particularly the ability to modify prepared content and adapt to players' actions, is key to play for GMs.

Based on our interview findings, we see how GMs create a world based around the player characters and improvise during play, adapting the story and planned content to meet the needs of the players. While this improvisation is an important part of the GMing process, we find that it is a skill cultivated by expert GMs but undersupported in learning materials for novice GMs. Improvisation is something that expert GMs more readily and enjoyably incorporate into their process, and is likely a skill developed with practice. Additionally, expert GMs have had greater exposure to sources of TTRPG advice as well as multiple TTRPG systems, and thus have more techniques and playstyles available to them while improvising. Our findings suggest that there is a need for greater support for novice GMs to learn the improvisational techniques described by our expert GM interviewees and by the essay authors of *Unframed* [53]. While these skills are important, common materials for learning GMing don't heavily support the kinds of improvisation that we see experts perform, such as preparing and adapting prepared content during play to fit the actions that the players take in the world. Below, we discuss how a computational assistant might help scaffold novice GMs and assist them with this improvisational process.

3.5 Towards a computational assistant

Our hope is that this analysis can help to inform how we create digital tools for GMs by providing insights into how GMs run their games and the problems that they face in this process. We aim to create tools that are relevant to GMs' needs and grounded in the actual work that they do. Here we suggest some design directions for a computational assistant for GMs, discussing three ways that a computational system could help to support GMs: 1) by providing planned information in an accessible format, 2) by allowing the GM to easily track changes that the players make to the game world, and 3) by providing suggestions for interesting things that can happen next based on the current state of the world.

We see in Section 3.2.3 that much of the work that GMs are doing in preparing for and running their games is taking planned content, either from a module or of their own creation, and breaking it down into a state that is more manageable. Taking information from a pre-scripted narrative and breaking this into smaller chunks can also help to make this content more modular (the necessity of which is discussed in Sections 3.2.3 and 3.3) so that GMs can more easily pull out the materials they need at any given time. Materials for existing TTRPG modules are usually provided in a book or digital PDF that is quite information-dense (an example of which can be seen in Figure 3.1). It can be difficult for GMs to access the materials they need, especially if this has to be done live during play. Managing a vast amount of information may also be difficult for GMs that create their own custom setting and characters, as they create

a good deal of information that needs to be accessible during the game but might lack proper references or indices. An alternative to this is a digital tool that already stores the information in a more modular format, letting GMs more easily manage information and improvise around different elements of the story, such as the characters, locations, quests, or descriptions of enemies. Having this information stored in a database can provide a clearer visualization of information that GMs need in order to understand the game world and more easily improvise off of this information.

GMs also emphasize in their interviews the importance of incorporating the players into the continuing development of the game's story, whether that is through incorporating player choices made during character creation (Section 3.2.1) or during play (Section 3.2.2). Part of being able to act on and provide consequences for player choices is having a way to keep track of what those choices are and the information that the players know in order to provide appropriate and personalized responses in the moment. Keeping track of all of this information, particularly pulling out the important elements from hours of gameplay across multiple live sessions, can be difficult, and this could be a potential area for digital assistance. A digital assistant could allow GMs to keep track of changes to the world and the actions the players have taken, for instance marking off information that the players already know, or changing an NPC's state from alive to dead, through a visual editor that already contains information about the game state (for instance, by using the knowledge database described above). This would allow the GM to keep track of what players have done during a session and changes that they make on the fly, which can be difficult to do given the real-time nature of

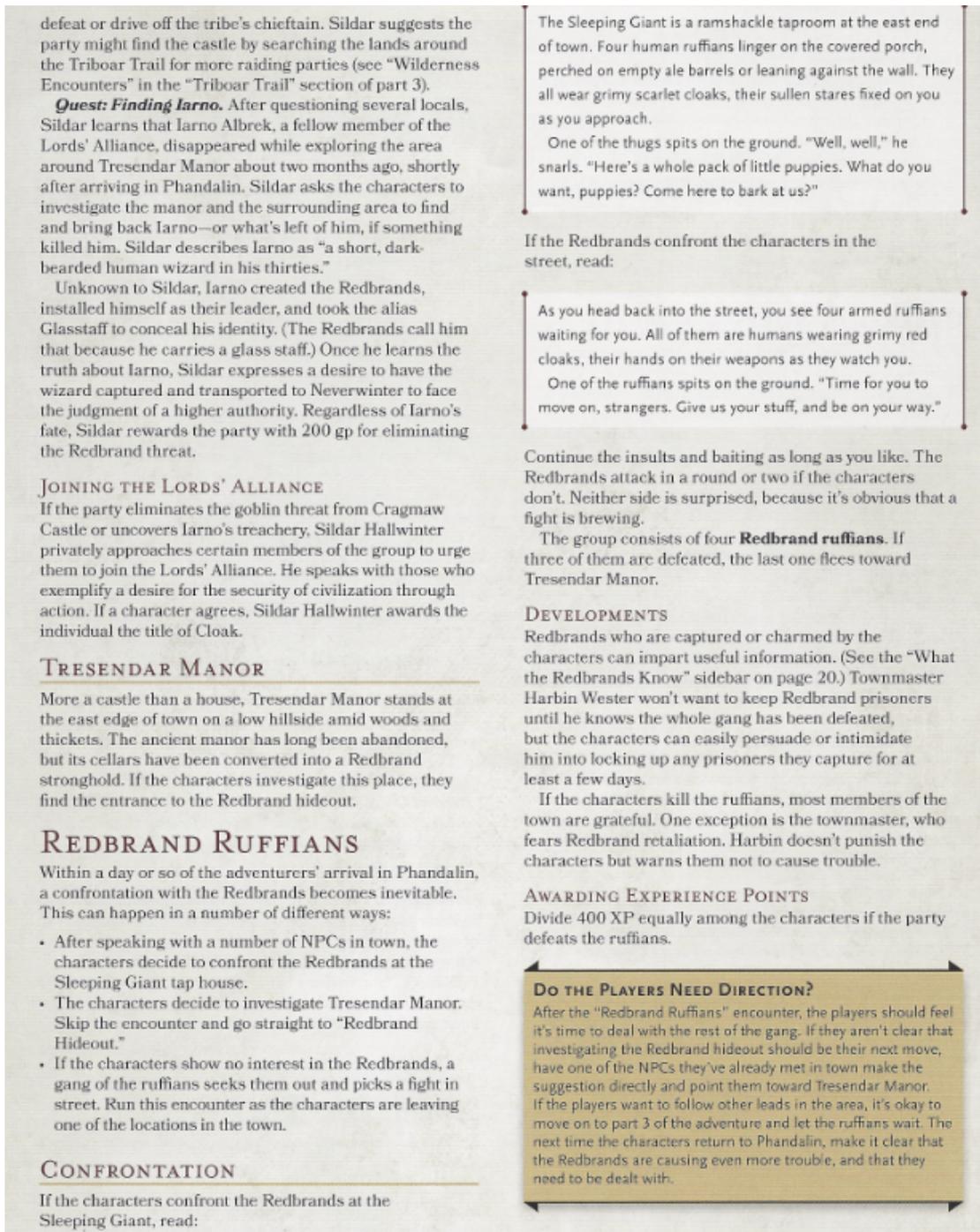


Figure 3.1: A page from the module *Lost Mine of Phandelver*

GMing. This could also be used to help GMs reason over the story space, for example by allowing them to search through the database to get a list of NPCs at a given location or secrets known by a given NPC in order to be able to better think through the logical consequences of player actions, as described in Section 3.2.2. If such a tool were to be used during play, though, it would need to be lightweight and extensible enough for GMs to make modifications quickly and easily during play so as not to create a large amount of additional overhead for GMs.

Finally, we aim to support improvisational storytelling for GMs. We found that novice GMs found improvisation difficult and when faced with players behaving unexpectedly, struggled to get them back on track or tried to enforce the story on players (see Sections 3.2.4.1 and 3.4). We hope that a digital tool could help scaffold this improvisational story creation, helping GMs improvise around unexpected actions and continue the story based on the directions players want to take it. By having the game state and changes made to it stored in a digital form (as described earlier in this section), a computational assistant could provide improvisational suggestions for what can happen next in the game based on the current state of the game world and players' past and desired actions. For instance, if the GM is not sure how the players should progress, the tool could provide suggestions for which next steps make sense for the players based on the information the players know and how far they have progressed through different storylines in the game. This could also help to accommodate unexpected player actions—for example, if the players kill off an NPC that has information that the players need to know, a computational tool could potentially provide suggestions for other NPCs that

can be the source of that information based on who the characters are and what they know.

3.6 Future work

Running a TTRPG is a process that can be rewarding but difficult. It requires skill and dedication on the part of the GM as they facilitate a shared story based around the actions of players. In this chapter, we analyzed interviews with GMs and advice on GMing in order to understand how GMs facilitate storytelling in an improvisational, player-driven and collaborative context. We found insights on the GMing process through this analysis and present the results of this work. In the next section, we look at another way of using interviews with GMs to learn about the GMing process by having GMs discuss how they would run a particular game module, and discussing with them a prototype for a digital tool for GMs. We hope that through the process of these interviews, we can better understand how to build computational tools for GMs, with insights that can contribute to the field of interactive storytelling as a whole.

Chapter 4

Designing and Assessing a Computational Assistant for GMs

We wanted to continue our work studying GMing by building out a prototype of some potential features of a digital assistant and showing this to GMs. We based this prototype on a specific module, *Lost Mine of Phandelver*, and interviewed GMs about how they would run this module and how they might use the provided prototype for running their game. We also look at online advice for GMing *Lost Mine* to see what common questions and techniques might arise from this. Below we discuss the methods for these interviews and analysis, our findings, and speculative designs for a digital GMing assistant based on these findings.

4.1 Methods

Following up on the work conducted in the first part of this thesis, we conduct another series of interviews to show how GMs would run a specific TTRPG module and ask them to assess a prototype for a digital tool for GMs. We wanted to see GMing techniques applied in a more specific context, and to assess what parts of a digital prototype would be helpful for GMs, as well as what they would like to see in such a tool.

We began by selecting a baseline scenario to use, both for understanding how GMs run their games given a specific context and for building out the information included in the digital prototype. We chose the module *Lost Mine of Phandelver*, a beginner module that comes with the *Dungeons & Dragons* 5th edition *Starter Set* [9]. We selected this scenario because it is designed as the introduction for GMs that uses a popular roleplaying system, and therefore is likely many people's gateway to learning and playing TTRPGs. Our interviews focused on Parts 2 and 3 of *Lost Mine* because these offered some interesting variance in play style (social, hub-based quests and combat) and player options (multiple paths to the players' goal), which could help us to see variations in GM style depending on the kind of content presented for players, and how digital tools could help to assist these various kinds of play.

We then created a digital prototype using the information from *Lost Mine* that GMs could use as a baseline to discuss the kinds of features that they might want to see in a digital assistant, particularly in the context of running that particular module. The

prototype incorporates some of the features we found could be helpful to GMs in the first part of this thesis. Some of what we found could be helpful for GMs include helping GMs brainstorm what can happen next, helping them keep track of player progress in the story, and displaying connections between various story threads as reference. Our digital prototype mainly focuses on displaying story threads and their connections, as well as information about various NPCs, but does allow for some interactivity such as the user changing information and connections, and tracking their progress through a flow chart of the module.

4.1.1 *Lost Mine* synopsis

Lost Mine of Phandelver is a four-part adventure for *Dungeons & Dragons* 5th edition that provides information about the story and characters of the module, advice for GMs about tips for running the game, and reference information such as stat blocks for monsters that the players may encounter. Here we describe some of the module to provide a sense of the information that the GM is working with and to provide context for the later interview answers and digital prototype that are grounded in the *Lost Mine* scenario. Because the module provides various paths through the story, we provide various information about how the players may reach their eventual goal (reaching the titular lost mine at Wave Echo Cave) but don't prioritize any one path through the game. For our interviews and prototype, we focus on Part 2 ("Phandalin") and Part 3 ("The Spider's Web") of the module, though we also describe some of Part 1 ("Goblin Arrows") here to provide context for the later parts of the story.

The introduction and Part 1 of *Lost Mine* establish the background and main hook for the players. A cavern filled with great riches and power—known as Wave Echo Cave—had been lost in battle centuries ago, but a trio of dwarves—the Rockseeker brothers—have located the entrance and are seeking it out to reopen the mine. However, there are other forces looking for the mine, including the ruthless bandit leader known as the Black Spider. One possible opening for the game is that the players are hired to help Gundren Rockseeker move some of his supplies (for a project that is then-unknown to the players) to the town of Phandalin. Gundren Rockseeker and his companion Sildar Hallwinter have gone on to Phandalin ahead of the players. As the players make their way towards town, however, they are ambushed by goblins. The players can then find the trail that the goblins have been using, leading back to their hideout. If the players go to the hideout, they find the captured Sildar Hallwinter, who tells the players that Rockseeker brothers have found the entrance to the famed Wave Echo Cave, and that Gundren has a map to the entrance but was captured as well and likely taken to Cragmaw Castle—the location of which he’s not certain, though someone in Phandalin might know. As a note, for the interviews, we assume that the GM has already taken the players through the first part of the game, and that the players have rescued Sildar Hallwinter and know about Gundren Rockseeker’s capture and Wave Echo Cave.

In Part 2 of the module, the players arrive at the town of Phandalin where they learn that many members of the town are being harassed by a gang called the Redbrands. Phandalin mainly serves to introduce the players to several of the potential plot threads in Part 3, and to give the players a threat to deal with (the Redbrands)

that can help lead the players to Wave Echo Cave. As part of their exploration of the Redbrand hideout, the players may encounter three bugbears sent by the Black Spider who are bullying a goblin, Droop. Either by interrogating the bugbears or saving Droop from being harassed, the players can get more information on how to get to Cragmaw Castle, where Gundren Rockseeker is being held. Dealing with the Redbrands also may teach the players about the Black Spider, a mysterious figure who is supporting the Redbrands and has ordered the leader of the Redbrands to capture or kill the players to stop them from interfering with his plans to take Wave Echo Cave.

The players can also talk to the different town members to learn other approaches to finding Cragmaw Castle and Wave Echo Cave. One possible route is talking to Sister Garaele, who has just returned to town injured. If the players talk to her, she will tell them that she was trying to deliver a silver comb to Agatha the Banshee, in exchange for learning the location of an important spellbook. She asks the players to do the task in her stead. The players will also be told by Qelline Alderleaf that her friend, a druid named Reidoth, can help them to find either Cragmaw Castle or the entrance to Wave Echo Cave, and directs them towards the ruins of Thundertree where Reidoth can be found. Finally, the players can talk to Daran Edermath who states that there has been unusual digging and sighting of undead creatures at the Old Owl Well outside of town and asks the players to investigate what's going on.

In Part 3 of the module, the players can pursue some of the leads they were introduced to in Part 2. The goal for this part is for players to get to Wave Echo Cave, either by rescuing Gundren Rockseeker from Cragmaw Castle and using his map to

get to Wave Echo Cave, or by finding the entrance to Wave Echo Cave another way. If the players have already learned the location of Cragmaw Castle, they can go there immediately and rescue Gundren Rockseeker. The players could instead pursue another lead from Part 2. For example, they could look for Reidoth at the ruins of Thundertree. If they do, they find Thundertree infested with monsters, including a green dragon. Reidoth will help lead the players to either Cragmaw Castle or the entrance to Wave Echo Cave if they help to deal with the green dragon, making it leave Thundertree. If the players investigate the Old Owl Well, they will meet Hamun Kost, a necromancer. Hamun can offer to lead the players either to Cragmaw Castle or Wave Echo Cave, but in exchange asks them to either deal with an orc camp that is disrupting his work or to go to Agatha the banshee and ask her about the name of the wizard who built the Old Owl Well, for his research. If the players go to visit Agatha, they have to succeed in persuading her to answer a question (unless they give her the comb from Sister Garaele, which will let them succeed automatically). She will answer most questions about the world that the players want to know, but will only answer one question. The players can ask her for information for Sister Garaele or Hamun. Alternatively, they can also ask her for the location of Cragmaw Castle or Wave Echo Cave. Once players reach Wave Echo Cave, they can begin Part 4 of the module.

4.1.2 Creating a digital prototype

The prototype we developed is based on the module *Lost Mine*, containing some of the features we determined in Chapter 3 might be helpful for GMs. We primarily focus

on knowledge visualisation, depicting the connections between characters, locations, and character knowledge, and their connections to various plot threads in the story. It tries to capture how players might traverse various paths through the story to ultimately reach their goal in the scenario. We created several depictions of what information the tool would display and how it would display it by creating text nodes and connections in a flowchart maker [2] containing the various plot points, characters, locations, character knowledge, and how these elements are connected to one another. The visualizations also depict the various story threads—different paths that players might want to pursue to help them reach the goals laid out in the module.

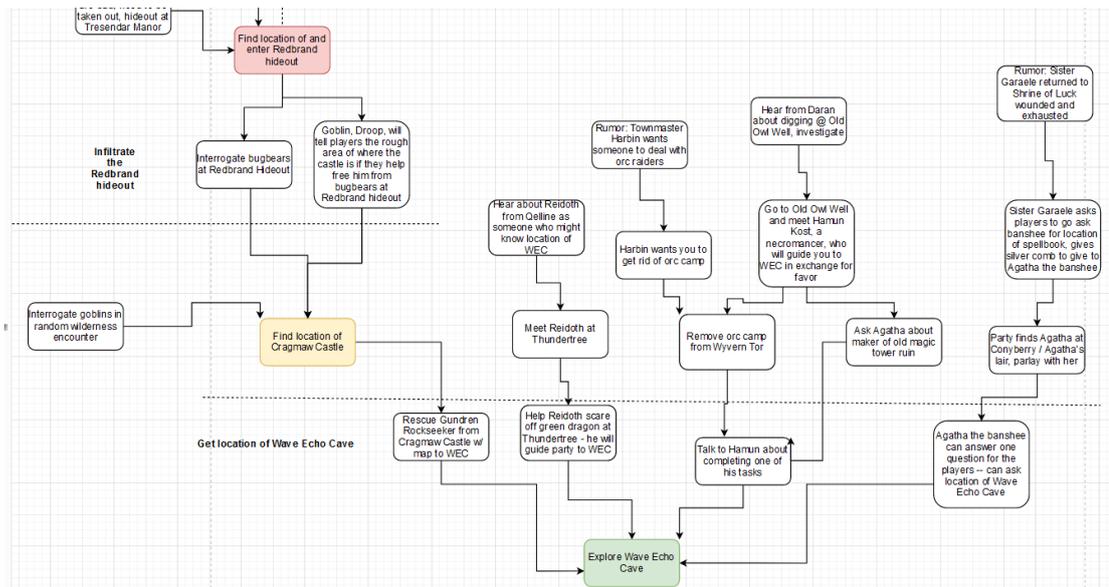


Figure 4.1: A section of the handmade graph detailing module information in *Lost Mine*

Our first visualization was a static graph as can be seen in Figure 4.1. After doing this, we wanted to create a prototype that could allow us to adjust connections and information as needed without creating many new graphs by hand. For our first

attempt at this, we used the Javascript-based diagramming tool Mermaid [69], which generates a graph based on a Markdown-like syntax that can be displayed in a webpage.

We began by creating JSON files containing the information from the module and encoding the connections between them. Each JSON object represents either a character, location, or a piece of information, and has a “tag” that other objects can use to reference it. The object also contains information on the connections between nodes—for example, each location contains an array of characters in that location, each character contains an array of the information they know, and information can lead to new locations or other information. For example, a character, Pip, who knows the secret location of a tunnel to the Redbrand base, is represented as:

```
{
  "tag": "Pip",
  "fields": {
    "name": "Pip",
    "status": "alive",
    "information": ["SecretTunnelKnowledge"],
    "friendOf": "Carp"
  }
}
```

The information that Pip knows about (referenced in the “information” section of the JSON object) is represented as:

```
{
  "tag": "SecretTunnelKnowledge",
  "fields": {
    "text": "Carp at Alderleaf Farm saw a secret tunnel in the woods;
    the Redbrands almost caught him",
    "known": "false",
    "locations": ["AlderleafFarm"],
    "goesTo": ["SecretTunnelLocation"],
    "storyline": "RedbrandStory"
  }
}
```

```
}  
}
```

We used JSON to represent the game state because it is human-readable and easy to edit quickly. In order to get the JSON objects into a state that can be displayed by Mermaid, we iterate through each of the JSON objects and generate the appropriate Markdown-like syntax for each node and their connections, and add these to the HTML file displaying the graph. Each entity’s (location, character, information) data is also stored in a DataScript [72] database that can be used to query for the relevant information when adding text to the visualization. For instance, it can be used to get a list of all the character names, or to get a character’s occupation given their name.

An example of the Markdown-like syntax generated by this process can be seen below. This displays the connection between Pip’s location (the Stonehill Inn) and Pip, the connection between Pip and the information he knows, and the connection between that information and the location that it leads to.

```
StonehillInn[The Stonehill Inn]:::locclass-->Pip{{Pip}}:::charclass  
Pip-->SecretTunnelKnowledge("<p>Carp at Alderleaf Farm saw a secret tunnel  
in the woods; the Redbrands almost caught him</p>"):::infoclass  
SecretTunnelKnowledge-->AlderleafFarm[Alderleaf Farm]:::locclass
```

The terms “locclass,” “charclass,” and “infoclass,” are used to differentiate the nodes as different kinds of entities (location, character, character knowledge), which is used to color the graph and make each type more visually distinct. The visualization for the above code can be seen in Figure 4.2.

We created several visualizations of the information from *Lost Mine* using Mermaid. In the expanded version (Figure 4.3), all locations, characters, and character

knowledge are depicted as separate nodes connected to one another. Each node type (location, character, or character knowledge) has a distinct color and shape to make it easy to distinguish from the other kinds of nodes. Connections are based on how these elements are connected in the story—locations have characters, characters have character knowledge, and character knowledge can lead to new locations or new knowledge. In the condensed version (Figure 4.4), characters and character knowledge are represented in nodes that display the character and the knowledge that they have together in one node. Nodes are colored according to which story threads they progress—contributing to helping the players defeat the Redbrands (red), reach Cragmaw Castle (yellow), or find Wave Echo Cave (blue). In some cases, character knowledge can help players either find Cragmaw Castle or find Wave Echo Cave depending on how the players advance. These are colored green (as the combination of the yellow and blue story threads). A third visualization (Figure 4.5) lists the various characters in the module and information about them, including whether or not they are alive, their occupation and faction affiliations, and their relationships to other NPCs (friends, family). This

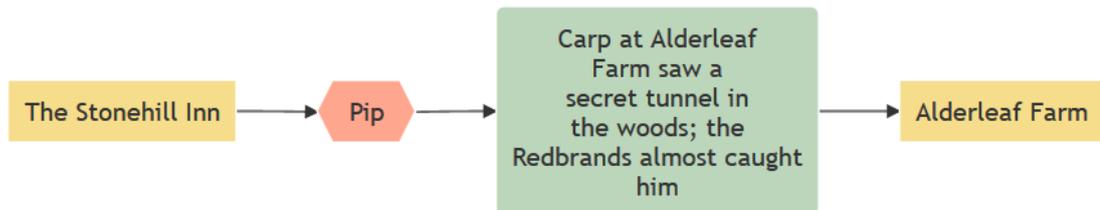


Figure 4.2: A sample visualization of the connections between locations, characters, and information

can be used as a quick reference of all of the characters in the module, and like the other two visualizations, it is updated if any changes are made to the character information in the corresponding JSON file or if changes are made to the database.

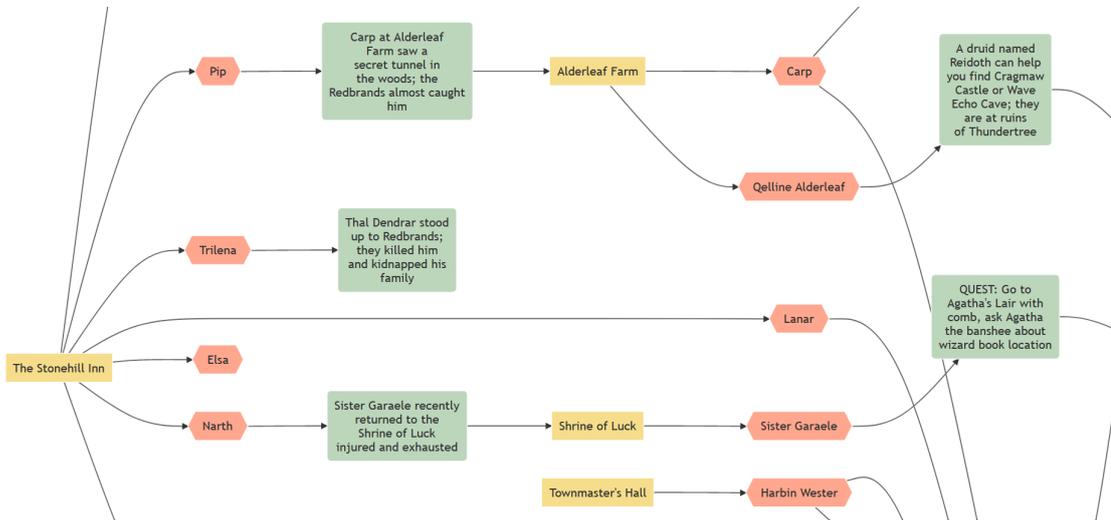


Figure 4.3: A section of the expanded knowledge visualization

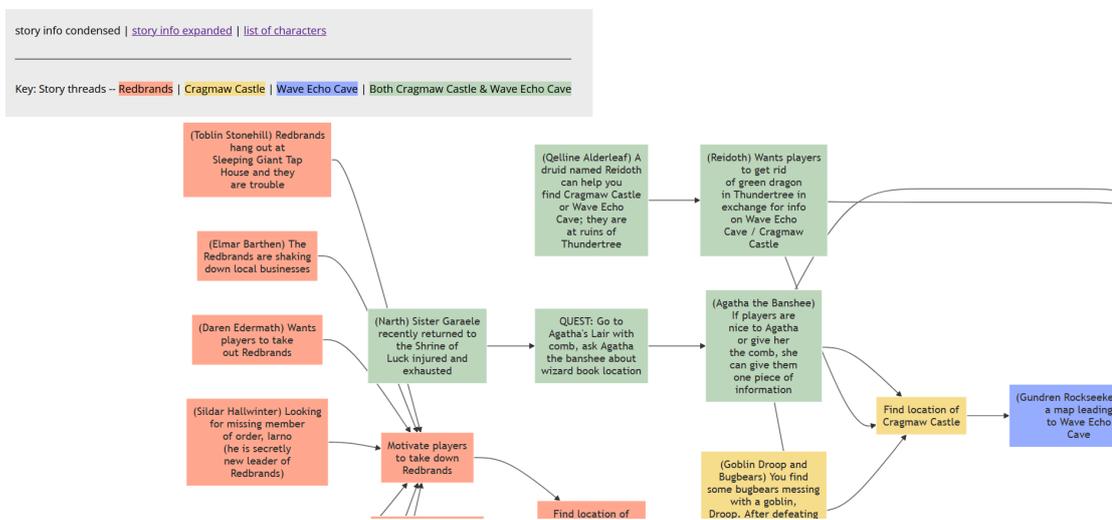


Figure 4.4: A section of the condensed knowledge visualization and key

We also wanted to create a visualization of this information that could be

easily altered by the end user so that quick adjustments could be done on the fly, as might be needed in creating visuals for hypothetical scenarios both before and during interviews. We used TiddlyWiki to create an interactive version of the graph using the same JSON files to populate Wiki pages that contained the text information and

List of characters:

Qelline Alderleaf

- Occupation: Halfling farmer
- Status: alive
- Family: Mother of Carp
- Friends: Reidoth

Sildar Hallwinter

- Faction: Lords' Alliance
- Status: alive

Linene Graywind

- Occupation: Runs trading post
- Status: alive

Gundren Rockseeker

- Status: alive

Thistle

- Status: alive

Narth

- Occupation: Farmer
- Status: alive

Pip

- Status: alive
- Friends: Carp

Reidoth

- Status: alive

Figure 4.5: A section of the list of characters and information about them

to generate a graph with the appropriate connections between nodes based on these pages (Figure 4.6). This visualization allows the end user to edit existing nodes and connections and add in their own nodes and edges as needed. This could be used, for example, for changing the content of the module depending on what the GM wants to run, and making changes to the graph depending on what happens during play. The user can also keep track of what has already happened in the game by clicking nodes that represent what the players have already done. This populates a sidebar that lists the completed segments (Figure 4.7).

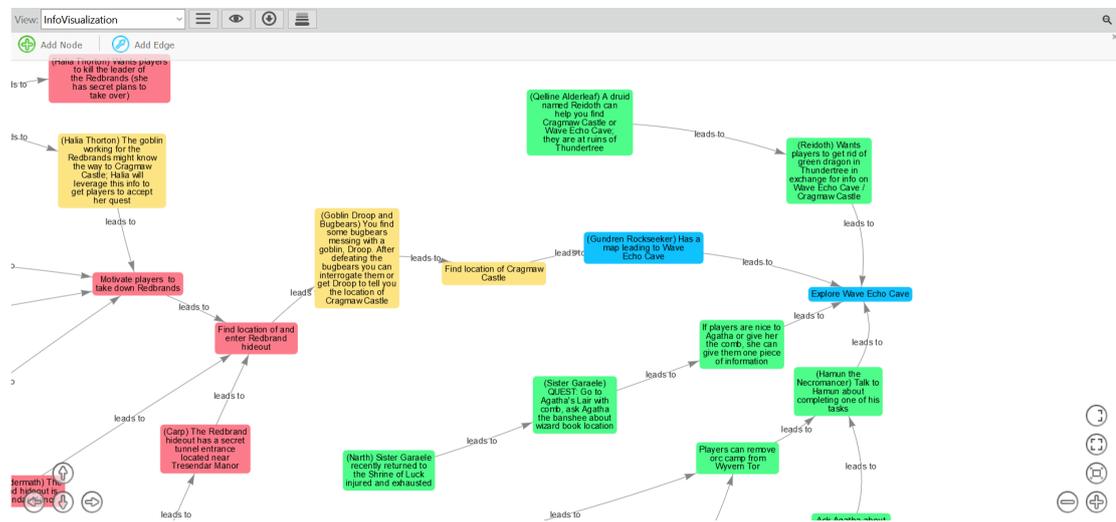


Figure 4.6: A section of the interactive version of the condensed knowledge visualization

4.1.3 Interview methods

We reached out to GMs based on convenience sampling [55], pulling from a pool of students and faculty members in the area. Six of the participants were previously contacted and interviewed for the work in the previous half of this thesis, and two

additional GMs were interviewed during this study. Of the interviewees, two had a relatively low level of experience GMing, while the rest were experienced GMs, with the labels for each interviewee and level of experience indicated in Table 4.1. Before the interview, we asked GMs to read the module *Lost Mine of Phandelver*, focusing on Parts 2 and 3, and to think about how they might run such a game themselves. After they had time to review the module, we conducted hour-long interviews with each GM individually to get insights into their GMing process and how a digital assistant could help with this. For the interview process, as with similar requirements analyses, GMs serve as both experts in this area and design partners in order to figure out the processes they use and how to help facilitate this process.

Questions for GMs focused on how GMs would run the module *Lost Mine*, using hypothetical scenarios to find how the GM prepares for their games, deals with players behaving in unexpected ways, and how they incorporate player actions into the

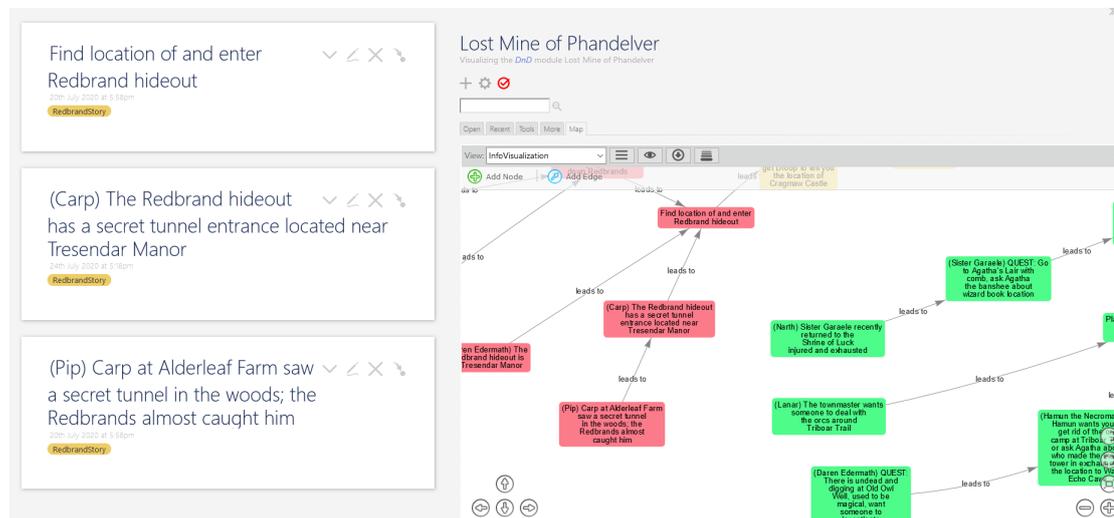


Figure 4.7: The sidebar listing visited nodes alongside the graph visualization

Participant #	Experience Level
1	High
2	High
3	High
4	High
5	High
6	Low
7	Low
8	High

Table 4.1: A list of interviewees from the second round of interviews and their experience level running TTRPGs

story of the game. We also asked other questions related to the digital prototype, such as questions about the information being displayed, how it might be helpful, and what the GMs would want to see changed about it. A table of some of the categories of questions and example questions in that category can be seen in Table 4.2.

For the interview, GMs were given access to several versions of a digital prototype (described in more detail above) via a link to the corresponding websites where they are hosted. Participants were free to use and manipulate this information, as well as a PDF version of *Lost Mine*, when answering questions. Both the interviewer and interviewee also had access to a collaborative digital whiteboard [1] that contained screenshots of the computational tool displaying the information in different ways. The interviewee had the option of writing on this whiteboard or drawing over the images in order to communicate their ideas or changes that they would like to see.

To analyze the results of these interviews, we used a similar methodology to the first round of interviews detailed in Section 3.1, using notes from each interview as well as recorded audio as a basis for qualitative coding. We generated a relevant code

Category	Example questions
Preparation/Recording	What are some of the ways that you would prepare for running this scenario? How long do you think it'd take?
Preparation/Recording	How would you handle keeping track of player progress and what has happened so far?
Players Getting Necessary Info	What happens if players don't want to go to Phandelver, which prevents them from getting leads on how to find Wave Echo Cave?
Players Getting Necessary Info	What if players burn their bridges with possible sources of info about how to get to Wave Echo Cave (Gundren, Agatha, Hamun)?
Skipping Content	What happens if players do not have enough experience by the time they get to Wave Echo Cave?
Using Player Choices During Play	How do/would you incorporate the players' character info, backstory, etc. into the game?
Using Player Choices During Play	What would you change based on the choices the players make? What's an example of this?
Digital Prototype	In what ways do you think this digital assistant would be useful? What would you use it for?
Digital Prototype	What would you change about the existing digital assistant?

Table 4.2: Example interview questions for second round of interviews

for each piece of information, either adding an existing code or creating a new one if no relevant code already existed. We then used these codes to create general categories of information. We include some examples of information from the interviews, codes, and categories in Table 4.3. We also examined online advice for GMs, looking at suggestions for GMs running *Lost Mine of Phandelver*. We compare the findings from our interviews to this online advice in order to further analyze our interview results.

4.2 Insights from GM interviews

From the interviews, we analyzed notes, screen recordings of the interview taken with the interviewee's permission, and any changes made to the graphs or whiteboard. We used these in order to ascertain more about the GMing process, how GMs responded to specific hypothetical questions regarding how they run their games and their thoughts on the digital prototype in order to ascertain what they might find useful in a digital assistant and how we can improve upon our existing design.

4.2.1 GM techniques for preparing and running a module

Part of what we were looking for in these interviews is seeing how GMs prepare and run games within the context of a particular example. This helps to provide common ground for understanding specific examples of GM techniques and how they employ them, and to allow us to compare different GMs to one another with a common reference point. Here we discuss what we found in regards to how GMs would prepare for and run *Lost Mine*.

Interview Text	Code	Category
[Lost Mine is] far from what I would do, tear this apart dramatically if using it, obvious stuff – encounters with characters who don't have names – those can go	Breaking up the module	Preparing for game
Looking at tools, appreciate flow chart, helps to know how I'd plan it out, flow of story, I can help to guide the players, would be good to have something to help map out stories	What you like about prototype	Digital tool analysis
Should be case that what you have done in one thing should affect other paths, maybe if you do something about the dragon, the bandits take that camp over too, once this threat is gone, it becomes a resource for another group	Player choice	Running game
Have used shared maps, hard to have multiple channels – have one visual thing, chat where dice rolling is happening, audio channel, hard to add another visual channel like map	Using digital tools	Tools and setup for play

Table 4.3: Interview notes for *Lost Mine* tagged with relevant code and category

4.2.1.1 Breaking up the module

Several of the expert GMs (2, 4, 5), stated that if they were to run the *Lost Mine of Phandelver* scenario, they might start with some of the material in the module as a basis, but would drastically alter the material to suit the kind of game they would like to run, using language such as wanting to “tear [the module] apart dramatically,” (2) or “cut[ting]... up” (4) the material. Along with this, these GMs stated that this kind of module is not something that they would normally run, with GMs #4 and #5 preferring to run more “sandboxy” games (5) with a large amount of player freedom and with GM #2 preferring to create their own game materials with close ties to the player characters.

Several GMs describe specific examples of how they would break up the module to run their own game using some of the existing material. GM #5 discusses wanting to reorganize all of the information into a different structure. He provides some examples of this—for instance, Part 3 has many open side quests for the players to pursue, and he suggests breaking this down into a list of events that are happening in the game world, the consequences of the events of the players do not interfere, and any other high level notes for himself. He also says he would like to reorganize the information in a different layout, for example a wiki that contains all of the information broken down into parts—for instance, given a room in the Redbrand hideout, a page that lists all of the things the player can find in that room, that lists that there are goblin enemies in the room, and has a reference to the goblin enemy stat block. Because of his more “sandbox-

y” approach to games, he suggests breaking all of the content down into independent modules to form a big list of things that could happen to the players, and where those events are located on a map, supporting players in wandering around and encountering events, rather than a heavily guided approach. Another reason to break up the module that GM #2 talks about is in order to allow the GM to remove and tailor remaining content to better match what the players want to see, things that would make interesting challenges for them, and in general to remove material that feels too generic—he provides the example of removing any encounters with characters who don’t have names.

This process of completely taking apart the module and repurposing content was discussed primarily by expert GMs. Novice GMs, in discussing how they would run the game, instead talked about sticking closer to the contents of the original module. While they might add or remove content (for example, removing quests that might not be interesting for their players (7) or thinking through the choices players might make and how this could change the story (6)), they tended to stick more to the prewritten material than expert GMs who might want to completely take the module apart.

4.2.1.2 Tailoring content to players

While a prewritten module provides many benefits to the GM, such as providing a setting, characters, and events for the GM to work with instead of needing to create all of their own content, this means that the content is created to work with any group of players, and therefore is not tailored to the specific players that are engaging with the game. This presents an “inherent challenge” for the GM—because the materials

aren't tied to the player characters in any way, in running the module as-is, the GM is "lacking the interesting part" of the game (2).

A large part of the preparation, therefore, involves figuring out how to build the story and plans for each session around the players. Some of this is based around what the players might want to do in a particular session, or where they are in the module and what logically follows next. This might also be based around who the player characters are—what their backstories are, the choices they have made, and the kinds of dilemmas that would be difficult for them to deal with.

GMs emphasize the importance of the character creation process (in GM #2's case, this is "first priority") in helping to guide the game. Many of the techniques that GMs discussed for incorporating the players in the game during the character creation process was to establish strong connections between the characters being created and the story—whether this be specific events that could happen, or ties to larger story arcs. GMs #2, 4, 6, and 7 discussed creating "hooks" in the game that would tie to specific part of the player characters' backstories or tailoring the material in the module to fit to what the players might want to see, with the character sheet and choices in character creation helping to expose to the GM what is interesting to players and what they might want to see in the game. For instance, if a player chooses to play a dwarf character, that character might have ties to the module's Rockseeker family, or if a player is choosing to play a wizard interested in collecting spellbooks, the GM could drop hints that the Redbrand leader is a wizard that may have a spellbook worth acquiring (6). GM #3 discusses creating interesting emotional moments for players by

having the players create (during character creation) dark secrets that they want to hide, such as the player characters' connections to the villain, to make for interesting reveals and player suspicion that can arise during play.

Tailoring content can also be based around what the players say their character struggles with, or forcing players to make tough and interesting decisions. GM #3 particularly emphasizes the importance of creating material that is “reflective” of players, both reflecting on who the players chose to play (the player's characters) and the players themselves to “maximize emotional engagement.” GM #2 discusses some examples of giving players difficult moments to deal with—for example, if a player character is afraid of dogs, giving the players a challenge where they have to sneak by dogs, or asking the players to choose whether to trust a character who has betrayed them in the past. These choices create “interesting character moments,” providing a moment for the player characters to show what their values are and how they deal with difficult choices. Regardless of how the players choose to deal with the situation this moves the story forward and thus doesn't require management of many branching story paths on the part of the GM.

4.2.1.3 Incorporating player consequences

Part of the work of the GM involves thinking through the choices afforded to the players and the consequences from the players' actions or inactions. Presenting players with many choices can be challenging, and GMs (1, 6) discuss reducing possible forward paths for players to give them different areas that they can pursue without

making them feel “bogged down” (6) with too many options. Once players make a choice of what to pursue, GMs think through what the consequences of those actions are, and if there are consequences for the players not pursuing other paths.

One of the ways that GMs discuss incorporating consequences to player actions is by providing consequences for non-actions, whether the players choose to pursue another path or if they just don’t want to deal with a particular problem. GMs (4, 5, 6, 7) provide characters with motivations and think through what it is those characters want and how they might go about accomplishing this goal. This means that if the players choose not to confront a certain group, the GM can provide “narrative escalation” (4) by having that group move closer to their goal, that may provide some harm to the world or the player characters. For example, if the players leave Phandalin and don’t want to deal with the Redbrands, the Redbrands may be more powerful when the players return, or cause more harm to the town. GM #6 discusses the necessity of this escalation in plain terms, stating that the villains will not just be in a room waiting for the players to come kill them; they will be doing things in the meantime such as preparing better defenses against the players or causing other chaos in the world. GM #4 states that regardless of whether the players choose to intervene, this should lead to something fun for the players and the GM—that is, even choosing not to engage with a group should still move the story forward and create an interesting moment.

A similar approach to this narrative escalation is treating the world as interconnected, in which have agents have motivations and choices as well as access to other areas of the map than their home domain. GM #2 discusses how based on player

choices, the world can change as different factions and story paths blend into one another. An example that he provides is that if the players work with Reidoth to clear the dragon out of the ruins of Thundertree, perhaps another group of enemies such as the Redbrands end up taking it over. This is part of a mentality of treating the game world as interconnected and living, created mechanically by changing removed threats into “resource[s]” for other groups to use (2).

Another area that GMs (2, 4, 5) emphasize is that in providing player consequences for actions, failure should always be a possible consequence of their actions. By providing the possibility of the players failing, for instance being defeated or captured during each encounter, the GM prevents each encounter just feeling like it continues on to a “foregone conclusion” (2). Another way of handling failure is by allowing players to “fail forward” (5)—for instance, if they are trying to get information and fail a roll, they may still get that information, but there will be some cost or consequence as a result. This way, the story continues to move forward instead of an uninteresting result of nothing happening on failure.

4.2.1.4 Developing characters and factions

GMs also discuss how they create and modify character content based on what they are provided with in the module. GM #2 discusses pulling character information out of the module, so that he can record separately each character’s information, motivation, and connection to the world. This can be used to easily swap around information as needed—for instance, changing a different NPC to have the information that the play-

ers need if this helps the GM (2). GM #7 discusses other traits that they create for their characters, such as how the character talks, what they look like, and how they treat the players when they are interacting with them. GM #4 also includes with characters the plot hooks that they offer players and where they push the player party. Information developed about characters can even be very specific—GM #8 discusses coming up with a backstory for Pip’s father, where the character left home because his father was overbearing, and now he behaves in an overbearing manner to his son. Another element of thinking through characters is understanding how they will react to the world, for instance if they belong to a particular faction or have ulterior motives different than what they present to the players. This can help guide how the GM plays out a particular character’s actions, and how they may help or oppose the player party depending on their actions.

Similar to developing characters, factions are an important part of the module that can help the GM to set the tone of the world and provide different groups with distinct (and possibly contradictory) motivations. GM #2 discusses the issue with factions as they are presented in the module currently—there are many factions, but the players (and GM) don’t learn much about them, and although players can join many of the different groups there is not much motivation for them to do so, and doing so doesn’t seem to have much of an effect on the game—instead it feels more like a “merit badge” for finishing a quest. He discusses how to make the choices for joining factions feel more “juicy,” and that the choice of joining a faction should also give the player a reason not to join them (2). For instance, joining a “questionable” faction like the

Zhentarim might allow the players some new form of help with encounters, but might also require them to betray those they care about (2).

GM #1 talks about how different hypothetical questions about factions and those in them can help clarify how each faction is distinct, and how they can contribute to the world based on their beliefs. For example, a faction's description might state that members of the faction believe that the best defense is a good offense. GM #1 asks how this belief might be contextualized in behavior and seen during play. Framing questions can help to better establish how to contextualize these beliefs—for example, asking how the leader of a given faction might choose to take a fort (by force, by coercion, by stealth, etc.) or how a member of that faction would deal with the situation if their town was taken over by a tyrannical leader (1).

4.2.1.5 Improvisation

Improvisation is an important part of the GM's toolbox—as GM #3 states, “Preparation is half the game, other half is improvisation.” Because GMs are creating the story and responding to players in real time, they can prepare content but have to adapt it to what is happening in the moment so that it meets the needs of the players and the story as it unfolds. This also means that prepared content might not actually come up, and that in planning sessions GMs have to prepare for many different paths that players might take, the “different eventualities” that could arise in play (8).

One way of handling this improvisation is by having lists of possible outcomes to pull from when trying to come up with the results of actions or something new to

happen to players. GM # 6 talks about building out lists of possible one-liners for NPCs, or lists of what NPCs might want to incorporate into the game as needed. GM #5 also uses lists and random tables to draw from in his GMing, but uses this randomness for him (and his players) to find meaning from it. He describes the fun of a process where, for instance, given a list of random things the players might find in looting a location, players create justifications for why those objects are there, and their significance. He also states that players will tend to “read into” situations as well and find their own connections, aiding in the improv process (5).

Part of the improvisational process involves guiding the story, and putting the players into interesting situations based on the circumstances of the story. GM #6 states that this is one of the “hardest part[s]” for him, improvisationally moving players out of the mentality of “random chatting” to bring them into the story. GM #5 discusses bringing the players into this improvisation by providing leading questions to players as they play, which leads players to come up with material that he himself would not have. He states that emotional, specific, and “grabby” questions are best to hook in players and get evocative answers that he can then work into the story, and makes it easier for the player to answer. For example, he states, asking a player why their character is on an adventure is not as strong a question as asking why their character is banished from their homeland, and what they have to do to return. This technique can also be used as the players are exploring the world. For example, GM #5 states, if the players are searching a cave full of fungus, instead of just asking them what they want to do next, he might instead ask a leading question, such as stating that now the fungus has

entangled the player character's leg without them noticing, what will they do about it? This style of leading question helps both the GM and the players establish something new about the world and drives the story forward.

As expected, some of improvisation is dealing with players behaving unexpectedly, or ignoring the plans that the GM has prepared for them. GM #3 states that the fact that the GM and players don't know what will happen next is "one of the things that make game worth playing," and that part of the process is making plans that "fall apart." This GM describes the module as more of a "blueprint" that the GM uses but that they can change whatever they want (3). Both GM #3 and GM #4 discuss swapping around material as needed if the players behave unexpectedly. For example, GM #4 states that if the players choose not to go to certain locations or engage with certain quests, she can still "recycle" this material as needed, or have further trouble "leak out" into the surrounding area. For instance, if the players choose to leave the town of Phandalin early without confronting the Redbrands, perhaps the Redbrands take the town's children to sell to slavery but one of the children escapes and finds the players, asking them to help.

4.2.1.6 Recording and planning between sessions

Part of the work done by GMs is recording what the players have done after each session and making plans for the next one. Sometimes, this recording of what has happened is done by the players, such as GM #4's shared campaign where the players add to the record of a ship's log after each session, recording what they suspect and their

interpretation of the events of that session. The GM states that while she takes notes herself of what happens during each session, seeing the players' fixation on a particular NPC or misinterpretation of the world's lore lets her know where she might need to remind players of certain information, and what new plans she should put into work for the next session. GM #5 also discusses his methods for recording information and planning between sessions. He describes recording information for game system *Blades in the Dark* [32] in which players are often criminals and thieves, recording what it is players stole in a particular session, anything that was generated or randomly added to the story (for instance, in drawing from a deck of random cards) during the session, and how these might tie into the world or become more relevant in future sessions. He also prepares a player-facing session report that summarizes the events of the last session and provides some interesting hooks into the next session. He states that he doesn't prepare much beyond the hooks, because he can improvise new challenges around whatever the players choose to pursue.

4.2.2 Analyzing the digital assistant

As part of the interview process, we are interested in assessing the prototype that we built in terms of what it provides and whether that is helpful to GMs. We also use this as a starting point to discuss the use of digital tools in running TTRPGs and to see what other features GMs would like to see in such tools, and how it might work within their current techniques for preparing for and running games.

4.2.2.1 Information visualization

The main feature that our current digital prototype provides is the ability to take the information from *Lost Mine of Phandelver* and display it in a chart that depicts the characters, locations, character knowledge, and the connections between them. This was helpful for GMs—they (1, 2, 4, 5, 6, 7, 8) stated that they liked that the tool condenses the many pages of information found in the module into a more accessible form that can be referenced in either planning for a next session or during play. GMs also talked about how the tool could be used to keep track of the game, listing for instance information the players know or actions that the players have taken, which could be used to help determine what happens next.

That said, GMs had many recommendations for improvements and features that they would like to see. One area that GMs (1, 2, 5) wanted to see was more visualizations of the relationships between characters, as well as a filtering/sorting feature to allow GMs to easily find the information they want and spot interesting connections that they can bring to the fore when preparing for or running their games. For example, if an NPC is in a given faction, GM #1 would like to be able to quickly see who else is in that faction, if the NPC is friends with anyone else in the faction, and other interesting relationships for that character. GM #2 added that they would also like to keep track of faction goals—what members of the factions want, and the next steps that they will take to accomplish this. They also wanted to know the goals and next steps that NPCs might take in order to better play out their story arc and drive the story based around

the characters and their motivations.

Other places where filterable lists and other group information could be helpful is in displaying information about certain locations, events, or quests. GM #7 talked about using the story visualization to be able to see interesting things that can happen when the players get to a certain location, for instance encounters that can take place there. Being able to spatialize the information (for instance, seeing everyone who is at the inn together in one place) was also important to GM #4. Some suggested a tag system (4, 5) could help provide more flexibility and help GMs customize the information that they can see.

Some GMs also pointed out improvements to the current story visualization. GM #3 discussed some examples of missing connections between nodes. He also suggested that each node should have multiple outgoing connections so that no matter where the players are in the story, there are multiple paths they can take to move the story forward.

4.2.2.2 Generative computation and co-creativity

While information visualization is a big area that GMs want supported and one that is heavily featured in the prototype of the tool, GMs also talk about other uses for computation in supporting GMing. One such area was in improvisation support and generating content for play. One of the main areas that GMs wanted support for is swapping around existing content or adding their own content; this is partially supported by the current prototype. Some of this was based on tailoring content to

players. For example, GMs #2, 4, and 6 talked about replacing the preset content in the module with content more specific to the player characters to help create player investment. For example, if a player character's backstory states that they dislike earth elementals, they might replace the generic enemies with earth elementals (2). There might be other reasons the GM would alter the preset encounters as well—for instance, to create fights that are more challenging to the party's current set of characters, or so that the encounters may better evoke the themes of their campaign (4). Swapping content might also be necessary to create new ways for the players to progress in the story. GM #6 gives an example of this from *Lost Mine*—if Hamun the necromancer has information that you want the players to know but they decide they don't want to meet Hamun, you can provide that information on another NPC, for example having the players find this information after defeating Iarno, the leader of the Redbrands (6).

One way that this content swapping could be facilitated using computational tools is by allowing GMs to manually change information (such as characters, locations, and character knowledge) around. In the current version of the prototype, the GM can do this by editing the text inside of nodes or adding new nodes to represent new story information, and creating and removing the connections between those nodes as needed. It might also be interesting to see how this computational support could be automatically generated or suggested—for example, providing an easier interface for GMs to input the changes they want to make and having this update automatically, or providing suggestions for changes that could be made to the scenario to make the game more tailored to the player's backstory, theme, or what players might want to see. As

GM #1 points out, swapping things around arbitrarily could lead to more complications down the line—for instance, if swapping out something related to a significant character or event, the GM has to make sure that all of the character knowledge that they still need to pass on to players gets passed on, and that everything still makes sense within the context of the story. Here, too, there is the possibility of having some kind of computational support, either suggesting swaps that make sense or smoothing out some of the complications that might happen as GMs make changes to the game’s knowledge database.

Another area that GMs mention for creating new content for games is in random or procedural generation. When running games, GMs have material to pull from, but also come up with all sorts of “off the cuff” content to suit the needs of the game, which add color and variety to the world. GM #1 talks about wanting to have a tool to help create information about a town, for example creating a random shopkeeper and having a randomizer to help the GM to determine what the shopkeeper is like, tone of voice, personality type, or providing improv cues for the GM (1). He also describes providing some constraints on that random generation, for example generating shopkeepers of a given race commonly found in the town. GM #7 also talks about having an NPC generator provide plot hooks that an NPC can offer or unique items that make that NPC more interesting to the players, and states that this could be useful if they were “in a rut” as a GM, or needed something to help motivate the players.

Finally, GMs (5, 6) also talk about having improvisational prompts for things that can happen next. GM #6 discussed how this would be good for beginners, espe-

cially for modules that are large, expansive worlds (the GM gives the example of Storm King's Thunder). In such games, there is a lot of content, but at any one time players (and the GM) might be at a loss for what to do next, and there may be large distances (either physically or narratively) between each chapter of the story, with players potentially missing the plot hooks connecting them (6). A computational system with some knowledge of the story threads as well as what has already happened could provide prompts for potential events that could happen next, or stepping stones to help guide players to the next part of the story.

4.2.2.3 Player-facing vs GM-facing content

Some GMs (1, 2, 7) talk about the possibility of using this tool in conjunction with players in order to build up more of a shared repository of what players know, and to build out the rest of the story together. One use for such a tool would be to allow the GMs to better see what players know and what they're interested in by having the players add to the flow chart, perhaps during or after a play session, to show what they learned, as a sort of journaling feature. This helps both the players and the GM keep track of what's already happened and also clues the GM in to what the players are interested in—if they are writing down events that are significant to them, then the GM knows to prepare more content related to those events in the future (1). Another option would be to have a player-facing version of the tool alongside the GM's version, in which pieces of the information are revealed to the players as they make progress in the game (7). This way the GM can still manage the information while providing

players with support for reflecting over what has already happened and planning their next actions. GM #2 also discusses GM and player collaboration using the tool, noting that this could be an interesting space for “creative generation,” letting players add their own notes and images so that both are building up the world together.

4.2.2.4 Integrating into GM workflows

GMs discuss how they might use the tool alongside their current setups. The GMs interviewed run both in-person games and entirely digital remote games, both relying on paper materials such as source books and note cards as well as digital technology, such as using a laptop or tablet during play. GMs (1, 4) state that when running their games, they want all of their information in one place. For instance, being able to integrate this tool with other existing digital tools such as those that track initiative, monster stats, or maps and encounter notes would be helpful. Some GMs (1, 4, 6) discuss wanting a printable version of the flowchart to avoid using a device with a screen during their games.

Some GMs (1, 4) are concerned about how using the tool could impact their real-time performance during a game, given the many other tasks they are engaged in. This could make it potentially something used more as a reference during play, and a creative assistant for planning and recording information between sessions.

4.3 Insights from online advice for GMing *Lost Mine*

While the GM interviews are helpful for getting in-depth feedback about both how GMs run their games and getting feedback on the prototype that we created, we also wanted to look at other sources of information on how people run *Lost Mine*. This provides more information from a greater number of individuals, as well as provides experiences from individuals who have already played the module and can talk about tweaks that they made while running the game and the problems they faced. Looking at online sources also allowed us to see more of the questions, problems, and experiences that beginner GMs had when running the module.

We examined advice from online blogs and forums, looking at the first 20 relevant pages of questions and comments in searching for advice on running *Lost Mine*, as well as searching within specific communities for discussing GMing. Our information is pulled primarily from online communities r/DMAcademy [4], r/DnDNext [6], r/DnD [5], as well as a collection of other blogs and forums that discuss running *Lost Mine*. If the online advice thread linked to another resource for helping run the game, we looked at this new page as well. To examine the results, we took the codes generated during the interview process (see Section 4.1.3) and categorized the online advice into these areas. Whenever we had a piece of advice that did not fit any given code, we created a new code to represent this. These pages contain information from around 260 different GMs, but we capture and code the advice from around 35 commenters, not including comments that repeat ideas that have already been discussed or that do not contribute

advice.

Overall, advice from online sources was largely consistent with the advice that arose during our interviews. Advice mostly fit into the existing codes, though we added three new codes—one for game difficulty (making sure that sections were not too difficult for players), one for theme (advice for GMs wanting to re-theme the module), and one for keeping the party together (making sure that player characters don't all wander off on their own). For the information that matched with previous codes, we found largely confirmatory advice and techniques pertaining to preparing for and running a TTRPG, including incorporating players into the story, setting up characters and encounters, improvisation, and examples of play from GMs' own games. Below, we discuss our findings from analyzing online advice and the common themes that arose from this advice pertaining to preparing for and running the module with a focus on GM-facilitated storytelling.

4.3.1 Tailoring content to players

As in our interviews, online advice in running *Lost Mine* suggested ways that GMs could tailor the module's content to the player characters. While the GMs in our interviews largely discussed having players create their own characters and backstories and how they would incorporate them (see Section 4.2.1.2), online advice predominantly suggests that new GMs provide players with premade character sheets, a list of suggested characters with some prewritten information about each character. This is because the premade characters already have some integration with the story provided in the

module, and GMs can draw on these existing connections to make the players feel more like the story is about them, rather than the story being a generic one in which they just happen to be the main characters [26] [63]. Because the rewards for completing quests are also balanced around the pregenerated characters, this means the GM does not have to be as concerned with changing a lot of content to fit the needs of the players. This discrepancy between advice from online sources versus the interviews is likely because our interviewees, being mostly expert GMs, have more experience running games and integrating player characters into the story of the game. In contrast, much of the online advice was targeted towards new GMs who might not have that experience, and having premade characters allows new GMs to already have ties between the player characters and the world that they can draw on as they add to the story.

However, like the interviewees, GMs online discussed a number of ways of integrating players into the story, using many of the same techniques as discussed in the interviews. One such example is tying player characters into the story by coming up with connections between the characters and existing content, or changing existing content to better fit with the player characters' backstories and motivations [24]. For instance, one of the player characters could be related to the Rockseeker brothers, could be a former member of the Redbrands, or could owe a favor to someone in the town of Phandalin. Tying the player characters' histories in with the world "makes [the players] feel connected to the world and more invested in your story" [40]. This can also mean tying the player characters together by finding connections between them. This can be as simple as having them all be members of the same faction, which will

provide them with a group motivation and tie them to specific characters in the module's world. Another possibility is to provide Fiasco-style relationships [63] in which players establish pre-existing relationships and connections to one another to help create a sense of inter-connectedness between players and establish character motivations [50]. They also suggest providing leading questions to players to help flesh out their history together, such as "Athrund, how did Celvak save your life previously?", or "Teraman, who among the Red Brand [sic] bandits do you and Yeshta hunt and why?" [63]. This is reminiscent of the leading questions interviewees discuss in Section 4.2.1.5.

Tying player characters into the game can also make for some powerful moments during encounters. One way of doing this is providing encounters that the player characters can excel at; one GM provides examples of this, such as "hordes of undead for the cleric to turn, preferred enemies for the ranger, lots of arrows for the monk to deflect" [24]. But this can also mean enhancing moments during gameplay, tailoring them to who the player characters are. One GM provides an example of this, where the player characters encounter a nothic, a monster in the Redbrand hideout capable of sensing the secrets of others through telepathy [9]. When the players encountered the nothic, "they each heard a voice in the backs of their minds, reminding them each of their biggest mistakes or regrets" [56], which the GM took from the backstories of each character. The players then had to make a Wisdom saving throw or else be overcome by their bad memories, getting disadvantage (in which players roll a die twice and take the lower score to resolve a check) on attacks and skill checks. Another example that a GM provides is during the encounter at Thundertree in which the players are supposed to

get rid of a green dragon making its home there. Because green dragons are intelligent and cunning, the GM wanted to lure the players in with a false sense of security, having the dragon appeal to each of the characters to make it seem like it would want to make a truce with them, and then attack them while they are off of their guard. One example that the GM provides [36] is appealing to the wizard’s logic, telling the character that he has the information that the party needs (ex. the location of Cragmaw Castle or Wave Echo Cave) and would be happy to share it if only they’d come closer and talk. Another example, for the fighter trying to tame the lands around Phandalin, is a promise to avoid attacking trade routes and to put on a show of being driven back from town by the mighty warrior [36]. Tying the dragon’s promises to specific things that player characters want might better help to bluff players into the con. This specificity makes “the game so much more memorable,” according to one GM’s advice [24].

4.3.2 Developing characters

As in the interviews (4.2.1.4), developing characters and their ties to the world was important to GMs in advice found online. One area that GMs discuss is creating memorable and intelligent villains for the players to go against. For example, the main antagonist pulling the strings behind many of the encounters the players face, the Black Spider, doesn’t as-written have much in the way of personality or motivation [20]. As one GM puts it, “he is one of the flattest villains I’ve seen in any form of media” [10]. The encounter with the Black Spider as provided by the module is also not that interesting or challenging for players, leading to what could be an anti-climactic ending

to the campaign. One GM suggests making this encounter more interesting for players by having the Black Spider set up traps or illusions for the players before the players arrive to make the fight more interesting [10]. Another GM suggests having the Black Spider be one of the citizens of Phandalin, perhaps who the players mistrust [56], so that they are placed within the world and not just revealed later.

GMs emphasize the importance of creating personalities for NPCs and thinking through their motivations to create an interesting world and situations for players. One GM states that they write notes on the mannerisms of each NPC so that they can better portray them in the moment, such as “James talks really slowly and has his eyes wide open all the time,” or “Maya sways back and forth and says ‘Um’ a lot” [24]. Another GM suggests reading up on each NPC’s “defining traits” in preparing for a game and coming up with a “persona” for each—for example, “an image to keep in your head, an accent, a bit of body language” [40]. Defining character motivations and their relationships to the party might better help convey to players what they should be doing. For instance, one GM states that “I had trouble early on remembering the goal of the quest...that gets the characters psyched up to resolve the adventure, risking life and limb along the way” and that by “play[ing] up the character of Gundren Rockseeker and forming a “tight relationship” between him and the party, players will be more motivated to find him, get revenge on his captors and help him to retake the lost mine.

NPC motivations can also be used to enhance encounters in the game. One GM states that “The majority of the enemies players will face are semi-intelligent humanoids, capable of being deceived, persuaded, or bargained with, so I would reward parties that

come up with more nuanced solutions than hacking and slashing their way through every dungeon” [20]. This also means that different enemies might behave in different ways depending on the encounter—for example, “wolves will team up to attack single characters, making use of their Pack Tactics ability, while Goblins will act as mobile skirmishers who run and hide after attacking” [41], making for more varied challenges for players. This can also be used to provide in-world justifications for modulating the difficulty of encounters or not outright killing the party when they are defeated. For example, one GM states that “those starting goblins aren’t crack Seal Team Six assault teams willing to fight to the death. Some might be silly, easily bribed or scared, or doing it for the money [and] status” and suggests that goblins during the fight could start looting bodies, fight among themselves about who gets some particular piece of loot, or run away if they lose too much health [71].

4.3.3 Cutting content

Much of the advice that GMs offered in regards to preparing for and running the game involved drastically cutting the amount of content for the game. The module provides a lot of content which might be overwhelming for new GMs—because of this, one GM “recommend[s] imposing LIMITS over imposing guidelines” by having GMs limit themselves to only a few interesting facts per NPC, limiting locations to only 1-2 interesting points per location then letting players explore them, only preparing content for the next session of the game, and limiting the total number of sessions played [39]. They also suggest in preparing for a next session to prepare one “main attraction” for

players, and one additional place that they could end up if they don't end up wanting to go to the first location [39].

The module itself presents many side-quests that the players can pursue in Parts 2 and 3 of the module, and one GM suggests to new GMs to “[c]ut whatever you don't need,” because “Phandalin is huge for a first time DM” [56]. Some of the ways they have done this in their own game is having certain NPCs be out of town for a few days as the players initially explore Phandalin, or removing content that might distract players from their main goals, such as the large number of factions that the players can join listed in the module. Other GMs also recommend steering clear of the many different faction offerings in the module [56] [68]—as one GM puts it, “[i]t's just a whole lot of gibberish and names...at that point, and it also drives focus away and confuses the players about what they're even supposed to be doing” [56].

4.3.4 Player consequences and improvisation

During our interviews, GMs discussed incorporating player consequences and improvising around player actions (4.2.1.3, 4.2.1.5). GMs online also discussed these areas, emphasizing the module as a way for new GMs to begin to feel comfortable with improvisation. Several GMs emphasize the importance of improvisation, noting that the source material is a “suggestion” [39] for things that could happen, but if GMs had ideas for things they wanted to change, they should change them [35]. Furthermore, players have not read the module, and therefore wouldn't know or be hindered by the fact that what's being presented to them is not the same as what is written in the module [56].

This encouragement towards improvisation is often in response to the real-time nature of GMing—rather than the GM pausing to look back for a while at the source material to figure out what should happen next, one GM encourages others to “just make stuff up,” stating that this is preferable to saying something to players like, “I have no idea, there’s nothing about that written here” [39].

There are different ways that improvisation can be used throughout the module. One GM discusses techniques similar to those discussed by our interviewees who favor a more “sandbox-y” approach to the game (4.2.1.1). This GM describes the module as “a series of small sandboxes stacked together” [63]. As players travel in and between these sandboxes, they have different choices they can make and different paths to traverse. Rather than constraining players to any one particular route, this GM encourages other GMs to “relish in [the players’] discussions about which way to go... and improvise as they take their chosen path” [63]. Improvisation can also focus on coming up with new content based on the consequences of players’ actions. One GM [41] discusses this in terms of different possible outcomes in encounter design during the Cragmaw Castle mission:

Even if the players “win,” there are many different facets to this encounter’s outcome - whether Vyerith escapes, whether Gundren Rockseeker survives, and whether the players find the hidden map to Wave Echo Cave. This kind of granularity, with multiple goals for the party to strive for, is essential to good encounter design. If your party completes some objectives but fails others, they’ll see that you’re offering them a real challenge and resolve to do better next time. This promotes engagement and makes the players feel like they have earned their successes.

Some examples of improvisation based around player consequences that this

GM suggests involve signalling to players the horrors of failure: “Glasstaff gets away? His mutilated body is found hanging from the ceiling of the inn. Player dies and enemies take the body? Have them find pieces of him/her with taunting notes from the Black Spider” [10]. This can also reward player behavior—the GM provides an example where the players feed some captive wolves meat, and later when the players are being overwhelmed by enemies, the wolves come in at the last moment to help take out the enemies and rescue them [26]. This GM encourages others to incorporate interesting interactions that the players have and failures that the players may face to tie into elements of the story later on and reflect the idea that the players “are truly affecting the story and world” [26].

4.3.5 Dealing with the green dragon

One discussion that arose quite commonly [56] [68] but didn’t come up during our interviews was a discussion of the green dragon encounter at Thundertree. Many GMs found that during play, this scenario was particularly difficult to plan around and execute. The encounter itself pits the players against a young green dragon, which if resulting in combat is likely a deadly encounter for the relatively low-level player characters. The players are told by Reidoth that they should try to get rid of the green dragon in exchange for directions to Cragmaw Castle or Wave Echo Cave, but some GMs worried that if new players tried and failed to go up against this deadly encounter, they might become discouraged or think they were doing something wrong [68]. That said, dragons are an iconic part of *Dungeons & Dragons* and an encounter with them should

be memorable and difficult for low-level players—simply making the dragon easier to kill would take away from this [68]. GMs had several suggestions for altering this encounter to help address some of these issues. One suggestion GMs had was properly signposting the difficulty of the encounter with the green dragon. Reidoth can warn players about how deadly the green dragon is, and warn them off of the encounter until they are strong enough. The GM states that “[i]t’s important to signpost encounters/areas ‘above [the players’] level,’” and suggests other ways to do so including having dead creatures in the area that look like they were also powerful, or providing rumors of the dangers in town [10]. This can also be facilitated by providing a way for the party to escape from or get out of a dangerous encounter without being killed—in the case of the green dragon, having the dragon parley with the party or giving them a chance to beg for their lives [56].

4.3.6 GM cheat sheets

GMs also created their own cheat sheets, summaries, and online tools to help with running *Lost Mine*. Some of these cheat sheets summarize plot hooks, characters, and story connections between content, similar to the information provided in our digital prototype, for example this cheat sheet (Figure 4.8) with some of the basic information that a GM might need to know to run the game [20]. This can help demonstrate the usefulness of more concise information that can be referenced during play and planning, even just as text. Other guides such as the one found at blog *My Realms* [23] features expanded descriptions of each of the areas, including background lore and suggestions

for changes to the campaign when running any particular section. Descriptions are based on locations to allow the GM to “expand the sandbox possibilities” [23] as the players traverse different parts of the game world. This kind of in-depth lore is not something we have in our prototype, but could be helpful in general. It’s also helpful to see the thought process of running a game broken down into advice for each particular location—this could be a good format for encounter-specific advice. Finally, people discussed online tools such as this encounter generator [3] that helps GMs adjust the encounters in *Lost Mine* to the experience level and number of players by providing suggestions that adjust the enemies’ health and experience earned for players. This shows how digital tools could already be used in the game, and provides a potentially useful integration with a digital assistant that manages other aspects of gameplay.

4.4 Speculative designs for a GM digital assistant

The goal of these interviews and analyses is to find interesting design spaces for building computational assistants for GMing. Below we discuss some potential design directions for a digital assistant based on our interviews and analyses of other sources of advice for GMs, both based on what it is that GMs want to see, and ways in which we can ease the process of GMing (especially for new players) by incorporating GM techniques into a digital tool.

4.4.1 Information visualization and tracking

One direction to go when further designing and developing a digital assistant for GMs is in the area of information visualization and tracking. As stated in Section 4.2.2.1, having the information from the module displayed in a more accessible way and visualizing the connections between information is helpful to GMs, both in helping GMs plan what they need to prepare for and as a reference for when they are running their game. This also provides a built-in way for the module to be broken up, as some GMs do themselves (4.2.1.1). We also see this supported by Section 4.3.6, in which GMs

i. Cheat Sheet. I am going to try to break down the entire adventure into the most basic of basic descriptions, this will be useful later!

1. *The hook.* Your party is on the way to Phandalin. Goblins ambush you. The goblins come from Cragmaw Hideout, an easily traceable lair.
2. *First Dungeon.* Your party will go to Cragmaw Hideout and defeat it. There is (Sildar) a human NPC there that is part of the main quest, but not required. The goblins/human will drop hints that a dwarf NPC (Gundren) was kidnapped.
3. *Town.* It's full of sidequests. There are thugs causing trouble, and they will attack the party if the party doesn't act first.
4. *Redbands.* The townspeople want you to kill the thugs, and the thugs will attack you. NPCs can help you find the redbands, or just walk up to their hideout.
5. *Second Dungeon.* The Redband hideout is a dungeon. The boss is a wizard, Glasstaff (aka Iarno, a sidequest objective) that you can kill or capture, doesn't change anything. Good loot in here. Learn that Glasstaff works for The Black Spider.
6. *Sidequests.* (order doesn't matter)
 - **Conyberry** - ask a banshee a question. Lady Garaele gives you a comb and a question to ask, but the banshee will answer any question (like where the mine is).
 - **Old Owl Well** - zombies at the well. go there and see why. Necromancer has a magic ring. Necromancer will trade info for completing **Wyvern Tor** or **Conyberry** for him.
 - **Thundertree** - There's a dragon in Thundertree. Chase it away and take care of the cultists and a druid (Reidoth) can lead you anywhere (like the lost mine). Lots of treasure. Can be done level 2 or 3, but prepare for TPK.
 - **Wyvern Tor** - there's orcs. Kill them and townmaster will pay you.
- ...7. *Cragmaw Castle.* Find Cragmaw Castle for money and to save a dwarf (Gundrin Rockseeker). There is a map to the lost mine there and an agent of The Black Spider.
- ...8. *Wave Echo Cave.* Go through the dungeon, The Black Spider got there first somehow. It's full of treasure and undead. Defeat The Black Spider, the end. If players go here before reaching level 3, they ded. Flame skull = potential TPK.

Figure 4.8: A cheat sheet with basic information from *Lost Mine*

created notes for themselves with important details from the module for quick reference. While the prototype we showed to GMs features some of the functionality that would be helpful in such a digital tool, we have several proposals to help further the design and development of an information visualization tool. The aim of such a tool would be to help display materials from a prewritten module in a more user-friendly way for GMs to use in both planning and running their game.

As stated in Section 4.2.2.1, GMs wanted to be able to see more information about characters and their relationships, as well as be able to more easily navigate this information to find what they might need. One way of enabling this in a digital tool is by taking the entities in the module—for example, the characters, locations, events, and information—and adding this content to a database that can be queried by GMs (ex. searching through a list of NPCs to find the NPC they are looking for) and that contains connections between entities (ex. a location contains a reference to all the characters at that location). Although our prototype visualization contains some graph visualizations of these connections and a list of characters, one can imagine a more robust system would allow for different kinds of visualizations, such as wiki-style pages that contain more information and filterable searches for entities. This could also include other kinds of graphs, such as one modeling relationships between NPCs or factions. GMs also discussed having a tagging system for information (4.2.2.1). We have already experimented some with tags such as those for indicating different story threads in the module, but there are certainly other useful ways to break down and display a scenario or module, such as allowing GMs to add custom tags to entities to indicate other story

information, such as a character's history, or the danger level of a location.

It is also important that GMs are able to edit and customize the visualization. GMs talk in their interviews about breaking up the module and changing content to fit the needs of the players. Therefore, being able to change the contents of the visualization to add, edit, or remove content when planning the next session or in playing the game is helpful so that the tool can keep up with the needs of the GM. For example, the GM could remove encounters that players might not find interesting, add in new enemy types that might be particularly challenging for the players, or record side events that were not planned for but came out in play. If an NPC has certain information for the players, this could be represented as a connection between the NPC's node and the information node. If the GM instead wants a different NPC to give the players that information, they should be able to remove the old connection and create a new one, which will subsequently update the database.

One area that this tool might be useful is in helping GMs plan and track their game. Because the tool already contains information about characters, locations, possible events, etc. it would also be helpful to incorporate tracking so that the GM can record who the players have encountered, what they know, and the locations that they have visited. This can be used by the GM both as a general reference for what the players have already done and thus where to lead players next—as one interviewee (2) points out, this might be particularly helpful in a mystery-style game in which the information that the players know and don't know is highly important. This also provides a way to more easily plan out consequences for player actions—for instance, in

seeing more easily the problems that the players have not yet dealt with, and creating new problems based on this. Having such a tool and seeing possible player paths forward also means that the GM may have less planning to do, as they can more easily see what they need to prepare for next session.

Such a tool could also potentially be used during play, with GMs making changes to the game state using the tool as the players act in the world. For example, if the players kill a specific character, decide to pursue a given lead, or move to a new location, the GM can reflect these changes using the tool. If the GM creates new content for the game—for instance, a new improvised character or location—they can add these to the game state as well. The GM can use the tool in real-time to find interesting connections forward in the story—for instance, if the players kill a specific character, the GM can look at that NPC’s family or faction and decide if members of those groups want to take actions against the players. For this tool to be used during gameplay, though, it would need to be quite lightweight and easy to use, as GMs will already be managing many other elements of running the game and keeping the story moving forward.

This could allow GMs to more easily pull out and incorporate consequences for player actions during play or in planning consequences for a following session, or figure out appropriate “narrative escalation” for things that the players have not dealt with (Section 4.2.1.3). More clearly displaying all of the module’s content could also help to facilitate the process of improvisation during play. GMs can more easily pull out and swap (or “recycle”) characters, locations, or information both during play and

when planning between sessions (Section 4.2.1.5).

Another area that GMs mentioned was integrating this tool with other digital tools that they use for GMing. Having this tool be compatible with other online tools for playing TTRPGs such as Roll20 [7] would allow GMs to have an easier time not have to deal with as many disparate parts when planning for or running their games. Having integration, either via links or embedding, to outside information such as monster stats, player character sheets, or supplemental rules, would also be helpful in a tool for GMs.

The prototype that we created was entirely based on *Lost Mine*, and the information contained would not be generalizable to arbitrary *Dungeons & Dragons* or TTRPG modules. In order to effectively create visualizations for arbitrary modules, one would need to extract the relevant information from the module and organize it in a database. In the case of our prototype, this was done manually, but this process takes significant time and effort. Having a tool that can automate this process would be helpful. One could imagine this kind of digitized supplemental information being offered along with purchasing a module in the future, in the way that digital PDFs or downloadable versions of maps are currently available for purchase.

Although much of what is described here is purely as a GM-facing tool, there is the possibility that such a tool could be used as a collaboration between the GM and the players. By allowing the players access to some of the tool information (for instance, having a player-facing version in which the players can only see the information they have found), this would allow for a space that players can keep track of what they know and make plans on what to do next based on what has already happened. By allowing players

to add or change information using the tool, the information visualization becomes more of a collaborative effort between the GM and players, and allows the GM to see more of what players remember and the information and people they found significant, which could help to guide future planning for games.

4.4.2 Generating tailored content

Another approach to designing a digital assistant for GMing is to leverage the power of computational systems to help create specific, generated content for games that GMs can use (or not use) as they see fit. This can be built on the same database as discussed in Section 4.4.1 to provide entities and their connections, as well as player progress in the game, for use in the generative process. There are many areas in which generative processes could contribute to TTRPGs [31] but as we are interested in facilitating improvisational storytelling, we're most interested in generating suggestions for things that can happen in the game world to help facilitate the story. Unlike random generators (ex. for names, locations) we are interested in generative processes that build on some knowledge of the game world, player characters, and history of what has happened so far. We base these ideas for generativity on the techniques that GMs described themselves using during play.

One possibility is basing generated content on the choices the players make in the character creation process. GMs discussed the importance of understanding who the player characters are, and using this as a basis for creating new content and guiding the players through the story. This could mean providing challenges to players for them

to showcase their strengths or challenge their weaknesses, incorporating elements of the player backstory into the game (for instance providing enemies that a player character has reason to fear), or providing plot hooks that are likely to entice specific players (for instance, the offer of a rare spellbook to a wizard character) (Section 4.2.1.2).

Another possibility is generating content based on the choices that the players have made so far. This can be as simple as providing the next steps of a plot thread that the players have started to pursue. Generative content could also pull from other information on what has happened so far—for example, the factions that the player characters have joined, or the problems that the players have not yet dealt with. This could be a useful way to provide prompts that GMs can use to incorporate the consequences of player actions into the story, drawing from both the interconnected nature of the game world and the actions that players have previously taken (Section 4.2.1.3). An example of this could be generating a suggestion that the Redbrands take over Phandalin if the players do not stay in town and help remove the Redbrands from power. This provides an example of “narrative escalation” (Section 4.2.1.3) based on the actions the players have taken and moves the story forward in an interesting way.

Another source for this generation can be NPC motivations. GMs describe giving motivations to NPCs to ground their actions and create a more coherent world (Sections 3.2.2, 4.2.1.3). By encoding motivations in the system, one could generate example actions that are based on NPC desires (how they are trying to change the game world). One possibility is generating background actions that NPCs perform while players are doing something else, such as the villain preparing for the player’s arrival.

Different NPCs having different interests or ideologies could also be an interesting source of conflicts or tension.

Another possibility for creative generation (particularly in planning games) is not providing suggestions but providing questions to the GM to aid with the brainstorming process. As discussed earlier (Sections 4.2.1.4, 4.2.1.5), hypothetical questions can be useful for thinking about how to actualize the values of factions through actions in the world. The tool could generate creative prompts, such as asking what might happen if a certain group is ignored, or who might be angry because the players made a particular choice.

Generation can be used to support both improvisation during play and for planning between game sessions. It's likely that improvisation during play would be more useful to new GMs, since more experienced GMs are skilled improvisers and enjoy that part of the TTRPG process (Section 3.2.4.1). This generative process requires having a robust computational system that can find patterns in the game world and generate interesting possibilities based on the current state. This can potentially be a good use of story sifting patterns [57] [43], helping to identify and surface relationships or conflicts that can contribute to the game. This could also be a space for integrating a social simulation language such as *Kismet* [67] that can help to generate suggestions for changes to the world based on the module's characters, relationships and events that have happened in the world.

4.5 Comparing first and second round interviews

One area that emerged strongly in Section 3 was the need to support improvisation during play, and the importance of improvisation to running TTRPGs as a whole. These interviews highlight the problems that beginner GMs face with running improvisation-heavy games, and the ways in which a digital tool could help to support improvisation: providing information in a more accessible format, allowing the GM to easily track changes they make in the game world, and providing suggestions for what can happen next based on what has already happened (see Section 3.5). In our second round of interviews, GMs heavily emphasized the ability to keep track of information, but did not emphasize as much runtime support for improvisation, instead mostly discussing this kind of support as part of the process of preparation between sessions. There are several reasons why this may be the case.

One reason for this may be that expert GMs don't need computational assistance to support runtime improvisation, as this is something that they are already confident with and handle in their games (see Section 3.2.4.1). Another reason for this may be because the first series of interviews asked for GMs' experiences in their own games, games that they have run in the past. As such, many of the examples and discussions of their techniques are based around occurrences that happened during play and methods they used to adapt during a play session. In the second round of interviews GMs were asked to reflect on how they might run a prewritten module, and as this is speculative it makes sense that much of the process GMs talked about was in

planning what they would present to players, rather than adaptation during play, since most GMs had not played this particular module. If GMs were asked to play and then discuss their process for running the module, this could lead to different results.

Finally, the prototype that we provided GMs mostly focused on visualizing module information, but did not feature live improvisational assistance. This likely means that the first areas were easier for GMs to react to and reflect on, while other benefits that the tool could have were more speculative and less immediate.

4.6 Future work

While there is still much more work to be done in this area, our interviews with GMs point to some interesting design spaces for computational tools to support GMing, including more information on how GMs run their games and information on what GMs would like to see in an assistive tool. While there are some limitations to the data collected here, such as the number of participants interviewed, we believe that this is a strong starting point for understanding how we can better design computational assistive tools for GMs. Further extensions of this work might include more interviewees with different backgrounds in GMing (for example, more beginner GMs, or GMs that use different digital tools in their process). This could also include gathering more supplemental sources of GM experience as we started to do in Section 4.3.

Next steps for this work likely include building out some of these speculative designs as actual functioning tools that GMs can use. While the prototypes presented

in these interviews featured some of the functionality that we were interested in testing, building out better systems to test (either via a Wizard-of-Oz study or by having the users interact with an actual system) would be even more helpful in assessing what works for GMs and any changes that they might want to see in such a tool. These interviews can also be tailored to the specific demographic targeted by those designing the tool—for instance, if it is a tool designed for beginners, it would be important to interview beginner GMs about the tool’s usability. While the prototype was created around information from *Lost Mine*, it’s possible that a future tool could be more suited to general-purpose GMing, capable of being used to help run many kinds of scenarios, either from *Dungeons & Dragons* or other TTRPG systems.

Another route towards understanding the GMing process and other elements of a successful TTRPG is looking at games as they are being run. It would be helpful to see and label actual playthroughs of TTRPGs in order to better see when and how GMs incorporate their techniques into their practice. This will likely provide more examples of how GMs adapt in the moment to players’ wants and needs. While examining GMs during ordinary play is helpful and could be done either by looking at existing material such as videos or livestreams, there is also potential research in setting up a particular kind of game to be played, as this could allow for variants to the game that answer different research questions. For example, one of the interviewees (3) discussed the possibility of a research experiment where players are given full information on how the game is supposed to go (for instance, access to all of the module material) and then try to actively work against or derail the GM, forcing the GM to the extreme of trying to

adapt to player actions as players may exploit their enemy's weaknesses or ignore story paths that they are meant to take. There is an interesting potential research space for other experimental styles of play that might not be seen during regular TTRPG play but that can help us better understand what goes into running TTRPGs, and this kind of experiment can help us test the extremes of this kind of play.

Chapter 5

Conclusions

We are interested in understanding the process of running TTRPGs by interviewing GMs who run them and other sources of advice for GMing. Through analyzing these interviews, we gain insight into the process that GMs use to facilitate live, improvisational storytelling for a group of players. We want to use this information to build digital tools to help assist GMs, using these interviews to better understand GM needs and to incorporate the techniques they use in their own games into the digital process. This thesis serves as the preliminary process for thinking through the design of such digital tools before they can be built. Although we have some initial insights into how we can better build tools to help GMs using GMing techniques and addressing their needs, we hope that this is just the beginning for research into TTRPGs and the potential of computational tools to assist in this process. By using these speculative designs to actually build out and test digital tools for GMs, we can better understand just how digital tools might function in the TTRPG play space and work into a GM's

process both in preparing for and running their games.

We hope that this research can serve as the basis for continuing research on TTRPGs. TTRPGs are a fascinating area of cooperative human-driven storytelling, and this project points to future research around examining this play process and scaffolding the GMing experience, particularly for new GMs who might not feel comfortable with a high degree of improvisation and uncertainty while running games. It also speaks to other potential routes for building out mixed-initiative story construction tools, and how people can work together with computational systems in order to tell stories together.

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