The Story, the Touchscreen and the Child: How Narrative Apps Tell Stories

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Abstract

Digital children's literature is a relatively recently established field of research that has been seeking for its theoretical base and defining its position and scope. Its major attention so far has been on the *narrative app*, a new form of children's literature displayed on a touchscreen computational device.

The narrative app came into being around 2010, and immediately attracted the attention of the academics. So far, various studies have been conducted to explore its educational potential, but very few have investigated the app for what it is in its own right. To bridge the gap, this study has explored the nature of the narrative app and the essential principles of its narrative strategies.

As the subject of this study concerns a variety of disciplines, this research has been conducted in an extremely interdisciplinary way in order to develop a thorough understanding of the narrative app. In general, it has consulted scholarship in children's literature (picturebook studies in particular), narratology, computer science, game studies, social semiotics, film studies, media studies, communication studies, electronic literature and game design.

With this interdisciplinary approach, this study has attempted to define the subject of the study, identify some tendencies in its development, and most importantly, develop an original theory of storytelling and a narrative map that may be able to explain the intrinsic methods used in the narrative app storytelling as well as other digital and non-digital storytelling. The findings of this study seem to suggest that the narrative app does not display any essential differences from the codex and other forms of literature in terms of its narrative strategies, but it appears to have great potential to truly innovate storytelling.

It is suggested that this study may provide an effective theoretical scope and methodology for the study of the field of digital children's literature, which may offer the potential to strengthen this field of research. The theoretical framework constructed by this study may be applicable to some educational approaches to the narrative app, and may also be useful for teaching new literacies.

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Acknowledgements

The day when I embarked on this PhD journey, never have I really imagined what it would feel like when I reached the end. Now that I am looking at the finishing line, a mixture of feelings surges up. As Leo Tolstoy would say, 'All finishing lines of PhDs are alike; each journey of a PhD proceeds in its own way'. I regard myself as one of the most fortunate, who although have experienced ups and downs, have been blessed to have had the kindest and most loving people around for the whole PhD journey.

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In the end, I wish to dedicate this thesis to my grandparents, my ‘laoye (姥爷)’ and ‘laolao (姥姥)’, who were born in the hard time in China, had endured all the hardships but had never ever given up upon their children’s education. My laolao passed away during the finishing stage of this thesis, but I hope that she would be proud of me in heaven.

Author's Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

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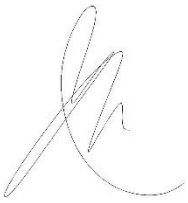
Signature: 

Abbreviations

A&A	Audois & Alleuil Editions
HS	Home Scene
LS	Logo Scene
MTB	Mechanical textual behaviour
NS	Narrative Scene
N	No
Q	Question
Y	Yes

A Brief Introduction

> *What happens when data aspires to literary form? What does it mean when the place where you're reading becomes the stage for story? How might writing, reading and the idea of the book itself change when we use technology to design stories, rather than just present them?*
>
> *Ambient Literature Project*[1]

Stories and Platforms

Stories are omnipresent in our daily life. They can be found on a piece of paper, on a canvas, on a statue, on a screen, on a stage, online, in street art, in musical notes, in a conversation… In fact, almost everything can be used to present stories as long as it is reachable by human imagination and achievable by the technology.

In recent years, with the rise of the touchscreen technology, children's literature has been introduced to a new way of storytelling known as 'app (application) storytelling'. The app, referred to as *narrative app* in this thesis, is a type of application software developed to tell stories to children on a touchscreen device. It usually contains visual, verbal, auditory and participatory features which are often seen in, for example, films, animations, picturebooks, hyperfictions and video games. Different from most kinds of storytelling, a narrative app invites/requires human participation to co-construct or co-create stories. The participant usually needs to perform various physical actions on a touchscreen to reveal hidden narrative content to move the story forward. These physical actions include but are not limited to tapping on the screen, pinching fingers on the screen, swiping the screen with one hand, shaking the tablet computer, blowing to the microphone, and moving or positioning the tablet in a certain way.

The narrative apps under investigation are not game apps. Their differences and similarities are discussed in Chapter Five. Succinctly, a narrative app is not necessarily to have game functions (referred to as *ludic features* in this thesis), but it must have a story to tell. A game app is not necessary to have a story background, but it must be ludic.

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[1] http://ambientlit.com/index.php/about-the-project/ accessed on 30 June 2017.

The appearance of narrative apps immediately attracted academic attention. Such attention is growing with a rapid growth of the app products for children. Various app researchers and publishers predict that apps are on the track of becoming paramount platforms for storytelling (e.g. Nuttall, 2017; Turrión, 2014). In this digital age where our life has become inseparable from digital technology, an inquiry about what narrative apps can do to our life seems to become natural and logical. In the respect of children's literature, the birth of narrative apps poses many questions. For example, what (else) can technology bring to (children's) literature? What may future storytelling look like? These questions require investigations on what technology had already done for storytelling, whether it had brought any radical or essential change to storytelling, and what the findings would mean to different groups, such as children, parents, educators, researchers, artists, the book market and policy makers.

Having said that, the majority of narrative app studies so far test mostly its educational potential in classrooms; very little work investigates the nature of the app or compares the new hypermedia forms to traditional formats of literature in order to understand their intrinsic similarities and differences. This theoretical gap prevents us from forming a rigorous discussion on the evaluation and effects of narrative apps. Therefore, to bridge the gap, I decided to explore the nature of narrative apps, the ways they use to tell stories, and the roles that the technology plays in the process of the app storytelling.

Narrative apps appear to be complicated entities fused with diverse aspects such as ludic (i.e. related to games and play), aesthetic (i.e. connected to beauty or beauty appreciation), and narrative (i.e. related to storytelling) aspects. The exploration of any aspect alone cannot avoid mentioning other aspects as they are presented in one package. However, as the exploration of each aspect relates to a different field of study that has its own theoretical basis, it is impossible to provide a satisfactory and thorough investigation on each and every aspect of the app in one single study. To be practical, this study has chosen to focus on the narrative aspect of the apps, but this does not indicate in any way that the various aspects of the apps are isolated from one another.

The Rationale for the Study

This study has been centred around three major questions:

1. What is a narrative app?
2. How does it tell stories?
3. How can we evaluate it in the context of storytelling?

Following my cognitive process in addressing the three questions, this study has been conducted from three distinctive and sequential perspectives, namely *a direct-vision perspective*, *a theoretical perspective* and *a practical perspective*.

To proceed, it is crucial to clarify the core concept of 'text'. In this study, the concept of 'text' was used differently from its use by linguistics and semioticians. The theorisation of the term takes place in Chapter Three. Here in short, 'text' is used similarly to its use in cybertext theory (Aaseth, 1997), that is, a text is considered as a mechanism consisting of signs, the medium to present the signs, and the human operator. It is within this triad – the collaboration of the three elements – that a text takes place. In this sense, a 'text' does not equal to 'signs'. The former includes the latter. 'Signs', in this thesis, refer to all kinds of signs such as verbal, visual, audio and tactile signs.

In this context, a text has been considered in this thesis to consist of two important aspects: the textual presentation and the textual meaning. This study has explored both aspects but paid more attention to the textual presentation. This, however, is not to suggest that textual meaning in general is not worth exploring. Purely for the purpose of this study, the textual presentation has been considered more crucial than the textual meaning in understanding how the narrative app works. This is because the narrative app is a relatively new phenomenon, and when facing a new phenomenon, this study has sought to understand *what it is* before going further to enquire about *what it means*. Understanding the textual presentation before understanding the textual meaning is just a preferred order for this study, but this is certainly not meant to be the only or the best way to study new phenomena.

In addition, although this thesis has divided a text into the textual presentation and the textual meaning to investigate, this is not to suggest that the textual presentation and the textual meaning is isolated from each other. Chapters Three and Four will discuss the relationship between the two in detail, but briefly, it is believed in this thesis that what the author wants to express will, to a large degree, determine how s/he will present her/his story with the aid of different signs

and media. Once the signs are presented, what the audience may receive or interpret is, largely but not entirely, by the arrangement of signs. In other words, in terms of the relationship among signs, media and sign receivers (i.e. the mechanism of a textual production), the textual presentation (how signs are generated and presented) determines the textual meaning (how signs are interpreted). Thus, what this thesis enquires about is the functional principles of this mechanism of a textual production in the respect of the textual presentation.

With such a focus, this study found that a popular theoretical approach in studying narrative apps, namely multimodality, turned out to be irrelevant to this research due to its distinctively different theoretical basis and focus. The core concept of 'text' in this study, as explained previously, has been understood and explored as a mechanism, while for multimodal research, 'text' is not a successfully theorised concept yet according to Adami and Kress (2014). In fact, multimodal researchers do not show much interest in analysing 'texts' rather than 'modes' (e.g. Jewitt et al., 2016; Kress and Van Leeuwen, 2006). A mode is generally understood as 'a set of socially and culturally shaped resources for making meaning' (Anon, 2012, para. 1). This means that multimodal research focuses on meaning-making instead of textual presentation. An in-depth comparison between this study and multimodality in terms of their theoretical scopes takes place in Chapter Three.

Having said that, from a direct-vision perspective, that is, from what can be directly perceived through the senses, this study has examined what a narrative app looks like and how it has been developed so far.

After the subject of the study had been defined, this study has explored how a narrative app works from a theoretical perspective, that is, it has situated the narrative app in the context of storytelling, and has explored how it tells stories and whether it has contributed anything fundamentally different to the basic principles of storytelling. To test and to complement my theoretical understanding of the narrative app, this study has switched from the theoretical perspective to a practical perspective, observing how the narrative app works in reality and what may affect its performance.

The scope of this study, however, has not been restricted to the narrative app alone. As a witness of various radical changes in human society brought about by technologies, I have had

a growing interest in exploring something that can transcend time and changes, something that can remain at the core and be unaffected by change. This pursuit has made me unsatisfied with merely understanding how the narrative app works on a touchscreen device. Thus, to extend this goal, besides the aim of understanding what the narrative app is and how it works, this study has also aimed to explore the basic principles of storytelling in general. In other words, I have aimed to explore the possibilities of having a discourse of storytelling that could be media-specific, but at the same time, might also be media inclusive. I hoped to develop a theory that could be flexible and updatable. In other words, a theory that could be applicable to the understanding and the analysis of various types of narrative texts and that may stand the test of time.

This has been a very ambitious project, which meant that I had to look beyond the field of children's literature, and try to familiarise myself as much as possible with various debates and concepts in related fields in order to seek a position that could give me a broader view of how storytelling works intrinsically. In other words, I needed an interdisciplinary perspective and interdisciplinary methods. To do this I consulted scholarship in fields of children's literature (picturebook studies in particular), computer science, communication studies, game studies, game design, social semiotics, film studies, media studies, narratology, and electronic literature.

However, I am aware that the development of a 'perfect' theory is well-nigh impossible. Thus, this project attempted to seek an angle that could be close to the view through which a text can be examined either based on its medium or despite its medium, and through which a medium may be fully explored and exploited in terms of its affordances for storytelling. In this way, the similarities and the differences between different texts may become more and more visible, and might move us closer to a comprehensive understanding of the nature of a narrative text. This may also help us develop coping strategies for learning, teaching and analysing different narrative texts.

The Thesis Structure

Following the rationale for this study, the core of this thesis is spread over five chapters that describe the adventure of my research journey. In this adventure, there were several radical moments that have fundamentally changed my view of the subject of the study, and these will be highlighted throughout the chapters.

Chapter One sets the stage by introducing the origin of the study, describing the subject of the study and reviewing its development in terms of its textual presentation. In this chapter, I also discuss my cognitive changes towards the subject of the study throughout its development, and justify several fundamental changes in my research questions and methods during the research journey. Starting from this chapter, a terminology for the academic discourse of the narrative app is built step by step.

Chapter Two examines an important concept in the narrative app discourse, namely *interactivity*. Interactivity has been considered a defining feature of the narrative app, but the term itself has rarely been defined in children's literature. Therefore, this chapter enquires about the meaning of interactivity, and examines its connection with the narrative app. This chapter is considered a crucial stepping-stone to the discussions in the later chapters because it sets the tone for this study, and considers the usability and the validity of a substantial number of terms in the study of the narrative app.

While the first two chapters can be regarded as getting to know what the subject of the study is from a macro point of view, Chapters Three and Four are two further steps to understanding how the subject of the study works from a micro perspective. These two chapters explore and question the relationship between the narrative app and storytelling at a theoretical level, investigating the basic principles of storytelling and whether the narrative app has brought anything fundamentally different to these principles.

More specifically, in order to prepare for a better understanding of how narrative apps tell stories, **Chapter Three** investigates how storytelling works in a general sense. In this chapter, I start to construct a theory that may be applicable to analysing different kinds of storytelling. I also apply this theory to studying the working principles of the narrative app in terms of its textual presentation.

Chapter Four develops the investigation outlined in Chapter Three, and improves the theory by expanding its explanatory and analytical power to the textual meaning. In other words, if Chapter Three is about the arrangement of signs, Chapter Four is about the effect of such arrangement on the narrative construction. The discussion leads to some exploratory criteria for evaluating the narrative quality of the narrative app.

Chapters One to Four complete my conceptual study of the narrative app. However, there are some questions about the narrative app that cannot be explored with purely conceptual frameworks. Therefore, to have a more comprehensive understanding of what the narrative app is and how it works, **Chapter Five** moves away from theoretical inquiries to empirical inquiries. Based on the empirical data collected from narrative app developers and my personal involvement in creating some narrative apps, Chapter Five explores the making process and the post maintenance stage of the narrative app, examining how the narrative app works in reality, what factors may influence its performance, and what future may hold for it.

Due to the interdisciplinary nature of this research and different perspectives of different chapters, this thesis involves a large interdisciplinary vocabulary and scholarship. To ensure a logical development of this thesis, a literature review related to each sub-topic will be provided separately in each Chapter. With multi-perspectives, the following chapters hope to unveil a corner of a potentially huge and rich picture of digital children's literature.

Chapter One: Setting the Stage

> *With rising sales numbers for smartphones and tablet pcs, apps are no longer technical innovation but rather a cultural phenomenon that touches upon potentially every aspect of daily life in Western culture.*
>
> (Stichnothe, 2014, p.1)

Introduction

To begin with, my research on the narrative app has gone through several fundamental changes in terms of its terminology, research questions, and methods. These changes were caused by the radical development of the narrative app on the market as well as the development of my understanding of the narrative app. Given that these changes in my research may also reflect the development and the debates of the ongoing research on the narrative app by other researchers, it thus seems necessary for me to introduce and discuss these changes so as to provide a wider picture (in so far as possible) of narrative app studies.

In this chapter, I will firstly provide the origin of the study, and will then using my own work as a case study to offer a review of the general development of the narrative app. Along the review, I will justify the necessity of the alteration of my research structure. A number of terms will be discussed and defined in this chapter while a wider terminology will be discussed in the following chapters (see Glossary for a complete list of terms).

The Beginning of the Journey

This research was conceived from my encounter with a game app in 2012. In October 2012, after receiving the MPhil degree in children's literature from the University of Cambridge, I started to seek a topic for a doctoral level research on picturebooks. While attempting to find a research gap in picturebook studies, I was introduced by my husband to an award-winning point-and-click adventure game named *Machinarium*[2] (Amanita Design, 2015).

[2] The game is developed by Amanita Design, and was released on 16th October 2009 for Windows, OS X and Linux. The version I played was released on 10th May 2012 for Android.

This game led me to consider the connection between the digital age and picturebooks. Aesthetically speaking, *Machinarium* (see figure 1-1) is a visual feast. The illustration of *Machinarium* is exquisite, nostalgic, and rich in detail. The drawing reminded me of Shaun Tan's picturebooks, and particularly his style in *The Arrival* (Tan, 2007) and *The Lost Thing* (Tan, 2011). Like a well-designed picturebook, the illustration of this game has much to offer to the visual journey of the player at all ages.

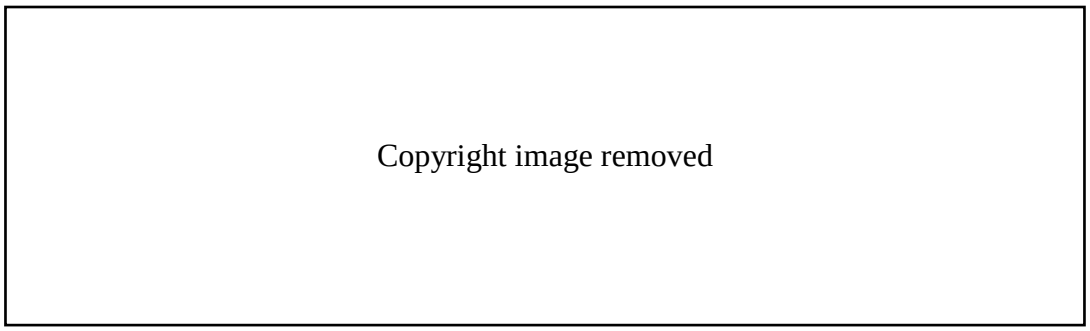

Figure 1-1: Two game scenes in *Machinarium* (Amanita Design, 2015).

In the aspect of the narrativity (i.e. the quality of or the condition to present a narrative), *Machinarium* is distinctively different from some popular mobile games such as *Plant vs Zombies* and *Angry Birds* series. Although *Machinarium* is located under the game section in Google Play Store, it has a profound storyline, well-rounded portrayal of characters, carefully designed plots, and most plausibly, all the game features in *Machinarium* are necessary to forward the plot. What I experienced with *Machinarium* lies in the intersection of playing a game, watching an animation and reading a picturebook.

When I was sharing my observation of the game with my husband who was a PhD student in computer science but did not have much knowledge of picturebook scholarship, he questioned me, 'Is this [*Machinarium*] a picturebook in digital format?' I pondered over this question for days. The question eventually gave rise to a series of questions about picturebooks entering digital age:

- Can we consider *Machinarium* as a picturebook in digital format?
- What happens when a picturebook goes digital?
- What is a digital picturebook?
- How does a digital picturebook tell stories?

- Will the narrative strategies of a digital picturebook be different from a picturebook in print format?

These questions drove me to the search of 'digital picturebooks'. It turned out that in 2012, there were already a great number of digital artefacts that have some resemblance to picturebooks. As new phenomena for entertaining and/or educating children, these artefacts were exclusively published as applications for mobile devices. As indicated by some published sale result of digital books for children in 2012[3], the market for such artefacts was likely to grow. Therefore, armed with possible database and basic research questions, I embarked on the journey to study these digital artefacts through the lens of picturebook scholarship within the field of children's literature at the University of Glasgow. However, with further investigation into the case, my research questions and methods had undergone dramatic changes.

The Rerouting

What changed first in my research was the terminology. As the appearance of digital products for children is a relatively new phenomenon, there has not been a consistent and consensus terminology for studies on these digital artefacts. So far various names have been given to the subject of the study, such as 'app', 'children's app', 'digital picturebook', 'picturebook app', 'book app', 'narrative app' and 'storybook app', to name a few.

Noting the terminological problem, Al-Yaquot and Nikolajeva (2015) suggest, 'if we are to discuss [this digital artefact…] academically, we need a new meta-language' (p.1). Their suggestion was taken as a priority to deal with in this study because the choice of terminology, to a large degree, may affect the research scope and the research methods. Therefore, the primary goal of this chapter is to establish a system of terms that can be used as a metalanguage for the academic discourse of the subject of the study.

To achieve this goal, I will start with building the definition for an app in a general sense, and proceed with a discussion of the particular group of the apps that are the concern of children's literature. Finally, by reviewing the terminologies used in both academic and non-

[3] For example, *Business Insider* reported in 2012 that '[s]ales of children's e-books nearly tripled over the first six months of this year compared with the same period in 2011' <http://www.businessinsider.com/sales-of-e-books-for-kids-are-exploding-2012-9>. Their notion of 'e-books' appeared to refer to both e-books and apps.

academic areas for addressing the subject of the study, I will suggest a term that seems to be most suitable for the subject of the study.

What is an App?

This study explored the nature of an app in general before going further to examine *the* app under investigation in children's literature. This is because the app examined in this thesis is a specific type of app whose technical nature is the same as any other app, but its presentation and function may be different. While its technical nature affects its presentation and its function (this point will be elaborated step by step in this thesis), to have a thorough understanding of what the subject of the study is, it thus seems to be necessary to know what it is in the technical sense.

Technically speaking, 'app' is a short term for application software, or simply known as an application. It is a basic term in computer science. According to OED online, entry 3. d. Computing, 'application' is defined as follows:

> A function performed by a computer to meet a specific user requirement; (now usually) a program or piece of software designed to perform such a function (as distinct from software which supports the operating system itself) (Anon, 2017a).

According to OCR (Oxford Cambridge and RSA) text books for A Level computer science, the application software 'is the set of programs that allow the user to do something useful with the computer' (Leadbetter et al., 2008, p.4). A detailed definition of the application software was later provided in the 2015 text book for A Level computer science in the United Kingdom:

> Application software is that which allows a user to perform a task or produce something. […] such as:
>
> **word processors**: Used for writing letters, reports and other documents
> **spreadsheet packages**: These allow a user to model complex situations, and are often used for financial calculations
> **presentation software**: Used to make on-screen slide shows to accompany presentations
> **desktop publishing software**: Used for documents where layout is important, such as newsletters
> **image editors**: Used to alter and amend images such as photographs
> **web browsers**: Allow a user to browse the world wide web. (Rouse et al., 2015, p.97)

The purpose of providing such detailed definitions of an application is to show that an application is a self-contained piece of programme that can be designed for *any* kind of computational devices, may they be desktop devices or mobile ones, it has various types, and has been widely applied to various occasions in our daily life. It is important to note that the definitions above do not suggest the interactive level of an app, that is, an app can be interactive, or not interactive at all, depending on the specific user's requirement. However, in today's mass media, and in academic research in children's literature and education, an app appears to be linked very often with high level interactivity and/or touchscreen devices.

To be precise, in recent years, as more and more application stores, such as Google Play Store, Apple App Store, Microsoft Store and Amazon Appstore, sell applications to smart phone and tablet computer users, the term 'app' has become a loose and narrow reference to application software designed for touchscreen devices running on the operating system of, for example, iOS (as in iPad and iPhone), Android (as in Google Nexus, Google Smartphones, and Samsung smartphones), and Windows (as in Microsoft Surface Pro). Even for this narrow definition, an app is not exclusive to Apple products.

However, most of the early research publications about apps in children's literature tend to focus on iOS apps designed for Apple products (e.g Al-Yaqout, 2011; Al-Yaqout & Nikolajeva, 2015; Sargeant, 2015; Schwebs, 2014; Stichnothe, 2014; Turrión, 2014). This strong focus on Apple products may not have crucial impact on the research findings, but the definitions of an app in these publications may appear tricky.

Precisely, some researchers such as Turrión (2014), and Al-Yaqout and Nikolajeva (2015) use the term 'app' in a self-evident manner without offering any definition. Some other researchers do not have a consensus on the definition while their ways of defining the term may appear to be problematic.

Stichnothe (2014), for example, adopts the basic understanding of an app in computer science, and defines an app as 'software designed to accomplish specific user tasks (in contrast to system software)' (p.2). The definition alone is not problematic. However what Stichnothe is concerned about in her research is not apps in general, but a particular group of apps: a type of iOS app designed for children and to run on touchscreen devices. Considering that such apps have some

key features that are significantly different from other apps, they may need a specific description in relation to the general definition that applies to any type of app.

In contrast to Stichnothe, Sargeant (2015) and Schwebs (2014) offer definitions that can only apply to a small number of apps which is the concern of children's literature, but the ways they construct the definitions make them look like definitions intended for all apps.

Specifically, Sargeant (2015) offers a definition that has a strong emphasis on the feature of human-computer interaction:

> Apps are computer software programs that are well suited to delivering high levels of interactive, media-rich content (Kleinfeld and McCoy, cited in Wikert, 2012a, n.p.). Apps can be designed for use on any computational device. They can seamlessly integrate written text, visuals, audio and interaction design. (p.459)

Sargeant provides an interesting definition. However, this definition appears to be confusing because it is not clear whether it is intended for apps in general or some particular apps. Compared with the dictionary and the text book definitions of an application, her definition appears to be too narrow for an app in general because the feature of 'delivering high levels of interactive, media-rich content' does not apply to every application. For instance, Microsoft Word is an app, but one may not usually expect MS Word to deliver 'high levels of interactive, media-rich content'. If this definition is only intended for *some* apps, it may require further specification, particularly in the beginning of the definition instead of saying 'Apps are […]'.

Moreover, Sargeant's reference to Kleinfeld and McCoy (Wikert, 2012), a blog post, does not seem to be appropriate because this blog post only features some excerpts of 'the behind-the-scene industry debates that take place via email' (Wikert, 2012, n.p), and these excerpts lack a complete picture of a terminological context. Furthermore, as far as the blog post concerns, it is about web apps. A web app, as the name suggests, is a specific type of app running with a web browser. Gmail, for example, is a web app, so are Facebook and Twitter which are mentioned in Wikert's blog. However, what Sargeant studies seem to be what she calls 'book apps' for children, such as *Little Red Riding Hood* (2013/2017) and *Heart and Bottle* (2010/2010) discussed in her article. Therefore, the blog post that Sargeant refers to may not be a suitable source to be based on to generate a definition for the subject of her study.

That being said, Sargeant makes an important point in her attempted definition of an app. She points out that an app can be made for any computational device, which means apps are not exclusive to mobile devices. This point directly challenges Schwebs' definition of an app. Schwebs (2014) defines an app as follows:

> An app is a software application typically designed to run on mobile media platforms like smartphones and tablet computers. Being equipped with touchscreens, these media utili[s]e predefined multi-touch finger gestures like tapping, pressing and scrolling. (p.1)

Schwebs' definition of an app, in the aspect of the computational carrier, appears to be much narrower than Sargeant's. As mentioned previously, Sargeant defines an app as software that can be designed for *any* computational device, which is close to what is indicated in the dictionary and the text book definitions of an application. Schwebs, however, restricts an app to the software designed for touchscreen mobile devices. Apps for touchscreen mobile device only constitute part of the application family, but like Sargent, the way Schwebs constructs the definition may make it difficult to tell if this is a definition for apps in general or for some apps.

The problem with Sargent's and Schwebs' definitions seems to be that they do not appear to have distinguished the small group of apps under their investigation from apps in general, which may have caused some conceptual confusion. In contrast to their ways of defining an app, some researchers (e.g. Aguilera et al., 2016; Serafini et al., 2016) directly define the particular app without mentioning its connection to an app in general. This way of practice usually describes the basic function of *the* app. For example, Serafini et al. offer the following definition:

> Picture book apps are designed to be experienced on reading devices, tablets, or smartphones or accessed using particular digital or Web-based platforms. […] In general, a picture book app is a type of software application that consists of picture book *content* in a digital *shape* and is downloaded from the iTunes store or Google Play or independent publisher websites. (p.1)

This definition is clearer than Sargent's and Schwebs' as it specifies which app group this definition is intended for. However, by giving rough description of what a so-called 'picture book app' looks like – 'picture book *content* in a digital *shape' — and* by specifying the locations to download these apps, it still does not seem to provide a clear picture of what this app is, and what it does.

In summary, it appears that those who try to define an app or *the* app for the field of children's literature seem to overlook a gap between the subject of the study and the apps in general. The apps that are studied in children's literature only constitute a very small part of apps developed for various computational devices. Therefore, it seems to be necessary to specify in the definition about which types of apps that are under discussion. To have a specified and clear definition of the particular group of apps, we may also need to define it in relation to the basic definition of an app so as to provide a clear picture of what *the* app is.

In an attempt to clarify a definition, based on the existing definitions of apps and the previous discussion, I provide the following definition as a definition of an app in a general sense and will further specify the subject of the study in this thesis based on this definition:

An app, an abbreviation for application, also known as application software, is a self-contained piece of computer programme allowing the end-user to engage with a computer. Microsoft Office or Internet Explorer are examples of an app. An app can be designed for any computational device, such as mobile devices or desk top devices. In recent years, the term has been used more narrowly when referring to applications downloaded by the end-user to run on a mobile device, such as a smart phone or a tablet computer. Neither the broader sense nor the narrow sense of an app indicate any level of interaction, if exists, between the end-user and the computer.

What is *the* App?

As far as children's literature is concerned, the apps being researched are not apps in general, but belong to a special group of apps designed for children. In this subsection, I will review the development of these apps by identifying some of their basic features as well as building a vocabulary for the further discussion in this thesis. If not specified otherwise, 'the apps' and 'the app' used hereafter both refer to the subject of the study, *not* to apps in general.

Bus et al. (2015) remark, 'the electronic stories available on the market are changing rapidly, including new features, new platforms and eventually quite novel reading experiences' (p.93). It is thus difficult to form a universal model that can describe the features found in all the apps. However, some general features can be summarised to reflect the common characteristics of the apps to date:

- They are computer software that can be downloaded from various app stores to the desired touchscreen computational device such as a tablet computer;

- As computer software, they are updated periodically to adapt to the new features and the new requirements of the specific operating system, to fix problems existed in the previous versions, and/or to add new features to enrich the experience of the people who engage with the apps;

- They are designed for children for entertaining and/or pedagogical purposes;

- They have embedded verbal, visual, auditory, participatory and/or interactive elements;

- *Most* of them appear under the categories of 'Books', 'Kids', 'Education' and 'Entertainment' in app stores;

- *Some* of them have game features to various degrees;

- *Most* of them have a story or some stories to tell.

In short, the apps may be described as application software designed to tell stories to children for various purposes.

Unavoidable Obstacles

Before moving to the detailed review of what the app looks like, it seems to be necessary to point out and discuss some outstanding situations that particularly faced by the app studies. These situations, on the one hand, may help us get to know the nature of the app, and on the other hand, may urge us to come up with some coping strategies to face these situations. In general, conducting research on apps has its own particular difficulties which centre round five major aspects.

Firstly, as this kind of app for children is a fairly new phenomenon, there has not been much scholarship yet on the subject. Researchers who study this subject are basically feeling their own ways to advance.

Secondly, the apps fall in the intersection between children's literature and digital media, which, as Turrión (2014) suggests, 'calls for an interdisciplinary approach in order to analyse different aspects of these products' (p.1). For this thesis, I consulted scholarship in children's literature (picturebook studies in particular), narratology, computer science, game studies, social semiotics, film studies, media studies, communication studies, electronic literature and game design. This list of areas might be useful to future research on the apps, but is not meant to be universally applicable. That being said, an obstacle faced by an interdisciplinary study is a consensus of terms, or in other words, one may need to strive for a terminological harmony for different fields in one interdisciplinary research. Since the same word/phrase may have different meanings in different disciplines, I found it extremely important for the researcher to have a rigorous understanding of different meanings of the same term, and to decide how to marry them so the result is peaceful. At times, it has been a great challenge for me to explore fields that I was less familiar with.

Thirdly, the conventions of the academic publishing have caused a considerable disadvantage for the app research. While the apps, as software, are being developed at an astonishing speed in both quality and quantity, the academic publishing process has not been accelerated for the sake of the app studies. This concern of the technology development outpacing the academic publishing on the apps has been brought up in both IRSCL (International Research Society for Children's Literature) 22nd Biennial Congress in 2015 and The Child and the Book International Conference in 2016. At the 2015 IRSCL, Yokota remarked that the copyright date of the publications on digital children's literature did not truly represent the research date. Using her own case as an example, Yokota pointed out that the copyright date of her article 'Picture Books and the Digital World: Educators Making Informed Choices' (Yokota and Teale, 2014) is 2014, but the actual research was done in 2012. In that two-year's gap, the app market for children had gone through remarkable changes in terms of the app design, which could not be reflected in her article.

Fourthly, being new phenomena, these apps pose a question to app stores and librarians in terms of categorisation. There have not been any commercial or academic agreements on how to categorise the apps, by content, for example, or by nature. As a result, as mentioned earlier, the apps are scattered in various categories such as 'kids', 'education', 'entertainment' and 'books' in app stores. Such a random categorisation of the apps may have caused difficulties for

researchers who try to collect data from app stores. This random categorisation also reflects a confusion about what the apps are. Such a confusion may have led to inconsistent citation styles for the apps in the academic publishing. There are researchers, such as Yokota and Teale (2014), who seem to cite the apps as books. Their reference entry starts with the author or the name of the developing company and then the title of the app. Some researchers, such as Yaqout and Nikolajeva (2015), cite the apps as software with the title of the app first, and followed by the developers and the version information. Some researchers seem to use an ambiguous style. For example, Turrión (2014) seems to cite the apps as software but do not offer version information.

In this thesis, the app is considered as software before everything. I will therefore follow Yaqout and Nikolajeva's citation style, but will add a few more details to the relevant entries in the list of references for various purposes. Specifically, to reflect the development of the app, I will provide the date of version 1.0 (the first released version) of the app in a '[]' next to the date of the (updated) version accessed by this study. To reflect the fact that the apps are not exclusive to Apple products, I will provide the information of the operating system, such as Android, iOS and Windows, in the end of the entry. For in-text citation, two dates separated by a '/' will be provided for the app information. The first date represents the released date of the app (i.e. the date of version 1.0), and the second date indicates the date of the actual version accessed by this study.

As for the fifth aspect, this particular group of apps, as computer software, have a significant feature in common: they are *virtual artefacts* and thus may not be expected to be approached, kept and preserved the same way as physical artefacts such as the codex. This means that new theoretical frameworks may be needed in studying the apps.

Specifically, theories used in comparison studies, for example, have been proved impossible by Al Yaqout and Nikolajeva (2015). As they note, 'there is no way to save the earlier digital version [of the apps]' (p.2). For printed books, when there are new editions published, the older editions can still be held somewhere physically. However, for the apps, a new edition means a software update. The update can happen automatically, or requires user permissions. In whichever case, once updated, the previous versions of the apps will be replaced by the latest versions, and will thus disappear permanently from the app stores and the cloud.

In addition, the apps can disappear from the collectable database without any notice. They can be removed from the app store for various reasons by either the app developer or the company who manages the store (e.g. Terms and Agreements - Apple Developer, 2016). For example, Audois & Alleuil Editions was a French independent publisher developing narrative apps for children. The apps released by this company were distributed to three major app stores: Apple App Store, Google Play Store and Amazon app store. The company ceased its business in 2016. Consequently, all the apps were removed from the app stores. For another example, Oceanhouse Media is a children's publisher based in the United States producing iOS and Android apps. In 2010, the company released an app called *The Cat in the Hat* (2010/2010) to Apple App Store, but due to unspecified reasons, this app cannot be found anywhere from the store anymore. The company still exists and keeps developing new apps including children's favourite books from Dr Seuss.

For the time being, when this type of app is removed from the app store, it does not affect those who have already purchased the apps as the apps are kept in the cloud and/or on the customer's devices if downloaded, but for those who have never purchased the apps, they will not be able to find them in app stores. Sharing might be a solution for building the app database, but considering that, at the moment, the apps still have absolute dependence on the computational device when removed from the app stores, sharing apps out of store means to share the computational device as well, which does not seem to be convenient, nor feasible.

The removal of the apps affects the record of its version history, too. A version history records the release date of the app, the date for each update, and descriptions of the new features brought by each update (see figure 1-2). App stores usually keep a version history of each app, which is fairly helpful for the researchers to keep a historical record of the development of the apps. However, if the apps are removed from the app stores, the version histories of the apps along with all other data of them will disappear too.

Faced by these five major situations, the research on the apps is expected to face unavoidable obstacles.

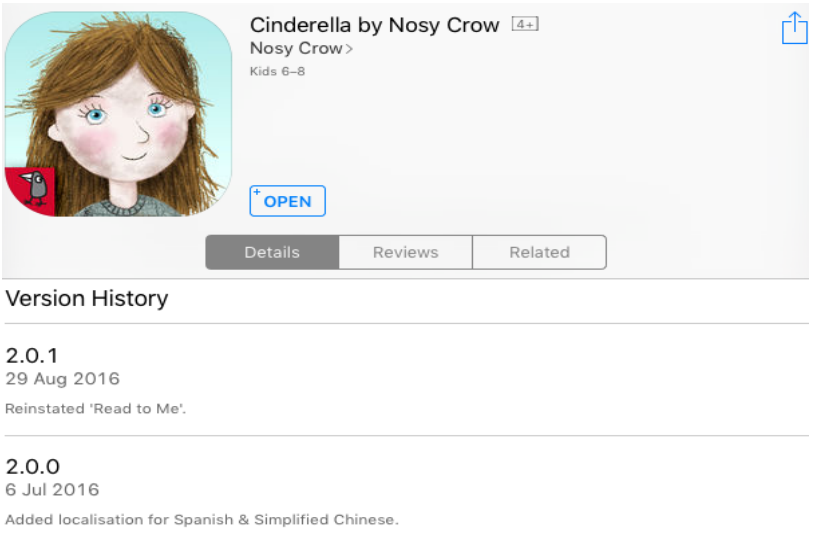

Figure 1-2: A screenshot of the version history of *Cinderella* (2011/2016).

The Development of the Apps: The Cluster

Based on the available records from major app stores (Amazon, Apple and Google), the apps appeared around 2010 in Apple App Store, and later became available for all other possible digital platforms such as Google Play Store and Amazon app store. An up-to-date list of some representative examples of the range from 2010 is provided in the Appendix A: *A Selected List of Narrative Apps*. The list includes the apps mentioned/studied in published research in children's literature, the apps in the final lists of a variety of awards for digital children's literature such as BolognaRagazzi Digital Award, the apps that have gained a good reputation from children's app reviewers, customer feedback and other mass (digital) media, and the apps that reflect some representative features in the narrative and the aesthetic aspects. The apps on the list, however, only constitute a small number of the apps on the market.

The list provides the information of the availability of the apps in different major operating systems, namely Android, iOS and Windows. The purpose of showing the information of the operating system for the apps is to reflect a noticeable tendency in the development of the apps: the platforms for the apps are being expanded from iOS system exclusive to other major operating systems.

The Development of the Apps: The Categories

So far there are three existing ways to categorise the apps. The first one comes from Yokota and Teale (2014). They suggest that the development of the apps at the time can be classified as

follows:

1) scanning entire print picture books,
2) transforming picture books into film-like creations,
3) transforming picture books with features unique to the digital world, and
4) adding interactive features, including games, that extend beyond the story' (p.578).

This is a classification based on visual impressions of the apps. It was helpful in understanding some tendencies in the app development at the time. However, the four categories have some overlaps with each other. There are some apps that, either in the past or on the current market, have combined features from more than two given categories. For example, *The Fantastic Flying Books of Mr Morris Lessmore* (2011/2015) (*Lessmore* for the shortened title) and *The Numberlys* (2012/2012) developed by Moonbot Studios are both 'film-like creations' (the second category) but also have 'interactive features, including games, that extend beyond the story' (the fourth category). *The Heart and the Bottle for iPad* (2010/2010) (*Heart and Bottle* for the shortened term) and *Avec quelques briques* (*With a Few Bricks*) (2015/2016) are both apps adapted from picturebooks under the same name respectively. They fit in both categories 3) and 4).

A different typology of the apps is provided by Schwebs (2014) who questions the integration of storytelling and technology in the app design. He provides a criterion that focuses on the 'birth' of the apps. Borrowing terms 'digital natives' and 'digital immigrants' coined by Prensky (2001) who use the terms to refer to human generations born before and after digital technology, Schwebs applies the terms to the apps, and says, if the apps are 'born digital', that is, if the apps are 'ambitious productions, exploiting the media's visual and auditory potential, including animations, puzzles and interactive tasks', these apps belong to the category of 'digital natives'; if not, that is, if the apps are 'simply reproductions of printed picturebooks […with stories] copied from the book to the screen page by page, and the only «enrichment» may be an option to have the text[4] read aloud', they are 'digital immigrants' (p.2).

Schwebs' criterion is a remarkable turn in the classification of the apps as he moves further from visual account of the apps to how well the app productions can utilise the affordances of the computer technology and allow the technology to aid storytelling. Although Schwebs'

[4] 'Text' here refers to signs, not a textual machine. This is my note.

classification is plausible, the key words, 'born digital', 'not born digital', might need to be rephrased because all apps are literally 'born' digital (that is, they all are digital products) despite the fact that some of them may be results of some remediation of stories (such as remediate a picturebook story to the app format). To avoid confusion, I have reconstructed Schwebs' definitions as follows for further discussions in this thesis:

- *Digital native*: the app that is tailored for digital storytelling, exploiting the potential and the affordances of the digital media in spite of its stories being original or not.

- *Digital immigrant*: the app that largely bears the resemblance of the presentation of stories told on non-digital platforms without much exploitation of the potential or the affordances of the digital media for digital storytelling in spite of its stories being original or not.

There are several points that need to be explained concerning my definitions. Firstly, 'native' does not mean 'original', and there is no connection between the quality and the originality of the apps. Secondly, as demonstrated in figure 1-3, there is hardly any clear boundary between digital immigrants and digital natives. The evaluation of how well an app exploits the potential of the affordances of the digital media is, basically, a matter of subjective judgement. Thirdly, when defining digital immigrants, I replaced 'printed picturebooks' used by Schwebs with 'stories told on non-digital platforms'. This is to reflect the various possibilities of sources (such as books, films, newspapers other than solely printed picturebooks) that digital immigrants can use to reproduce stories, despite that printed picturebooks are the major source so far for digital immigrants.

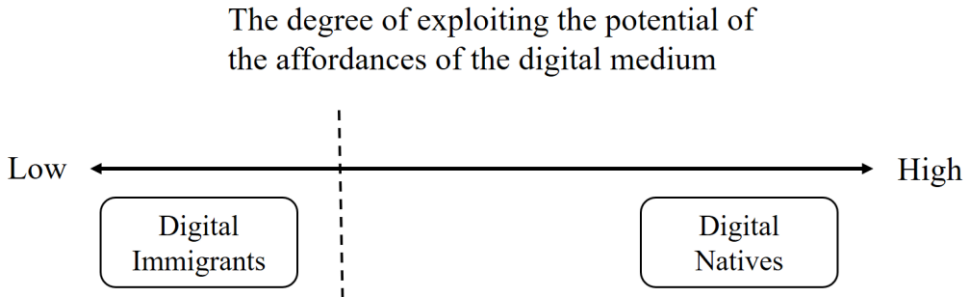

Figure 1-3: The Scale of Digital Immigrants and Digital Natives

While Yokota and Teale's typology focuses on the phenomenon and Schwebs' is on the design, Stichnothe (2014) offers a third way of classifying the apps based on the narrative aspect. Drawing on the terminology for narrative studies provided by Bal (1985), particularly 'fabula' (what happens) and 'story' (how the fabula is told) (p.5-6), Stichnothe divides the apps into two categories: 'multiple fabula app' and 'alternative story app' (p.4). According to Stichnothe,

> Multiple fabula apps follow the concepts of "creating your own story" or "choosing your own adventure" [… while] users can determine (to a certain extent) *what happens* in the narration. […and] alternative story apps offer interactive options on the level of *story* […] but not necessarily on the level of the fabula. (p.4-5)

Stichnothe's classification of the apps brings the study of the narrativity of the apps to a theoretical level. However, there is still a problem with this categorisation. The term 'alternative story' indicates that there are more than one stories provided in the app, and 'alternative' may also suggest that the 'interactive options' in these apps are optional. However, there are apps that do not contain optional participatory elements, nor do they fall into the category of 'multiple fabula apps'. In these apps, every human participation is necessary for the narration.

For example, *With a Few Bricks* (2015/2016) is an app in which both 'what happens' and 'how the fabula is told' cannot be chosen. There are participatory elements in the app, but each and every one of them needs to be triggered with a particular way in a fixed order, so these elements are not 'alternative' at the level of 'story'. Moreover, the app only has one fabula, and does not have alternative story, which means this app and those that are similar to it fall out of Stichnothe's two categories. To temporarily solve the problem, and to avoid being too conclusive about the app development, I propose to replace 'alternative story' with 'single fabula', and to update Stichnothe's category into *multiple fabulae app* and *single fabula app*. *Multiple Fabulae app* refers to the app that has more than one fabula in the narrative where *what happens* can be determined to some extent. *Single Fabula app* refers to the apps that only has one fabula in the narrative where *what happens* cannot be determined.

Despite their limitations, the classifications offered by Stichnothe and Schwebs are significant for the app studies. The two classifications share intersections but also complement each other as one focuses more on the content and the other on the design. The content and the design of the apps are considered equally important in this thesis, and therefore I will use my

modified definitions of both Stichnothe's and Schwebs' vocabularies in the following discussions on the apps.

The Development of the Apps: The Presentation (Design)

Although the apps came out in heterogeneous forms in the very beginning and thereafter keep developing heterogeneously, there are some general tendencies that can be used to obtain some basic features of the presentation of the apps, i.e. what the apps look like.

In the aspect of visual presentation, the apps generally consist of three basic parts that I have called *logo scene*, *home scene* and *narrative scenes*:

- **Logo scene (LS)**: A scene that shows app developer's logo usually with animated features, which is similar to a film production tradition where before a film, the audience will be shown with a very short animated logo of the film studio, such as the roaring lion of Metro Goldwyn Mayer, or the shield of Warner Bros. The LS in the app sometimes has background music, and it is usually presented before the *home scene* of the app (see figure 1-4).
- **Home scene (HS)**: A scene usually comes after the LS, generally displaying one or more of the following content: the title of the app, names of authors, option buttons for different ways of engagement (such as read by oneself or be read to, sound effect on or off, etc.), hints for full exploration of the app, and hyperlinks to credits, developer's information, developer's other apps, and information for adults, etc. Some may also present a very limited amount of narrative content. (see figure 1-5).

- **Narrative scenes (NSs)**: Scenes that present the main narrative/narratives (*what happens* and how *what happens* is told). In an NS, there are usually but not necessarily some function buttons/tags displayed alongside the frame of the scene (see figure 1-6). These function buttons/tags include but are not limited to:

    - *home scene button*, usually, but is not necessarily, designed as an image of a house where one can tap to go to the HS;

- *navigation button*, usually, but is not necessarily, designed as an arrow or a hand pointing to the direction of the narrative flow. One can tap it to go to the previous or the next scene;

- *scene tag*, where one can drag to reveal the *story pane*;

- *story pane*, a design similar to chapter selections in DVDs, that consists of screenshots of all scenes in the app. One may choose any scene to continue with the story;

- *option button*, where one can choose from different options provided to experience the app in different ways.

Figure 1-4: Examples of LS. From left to right, LSs of Nosy Crow Ltd., Audois & Alleuil Editions, and eToiles. N.B. Nosy Crow's and eToiles' LSs are short animations which are impossible to present in this thesis in print format.

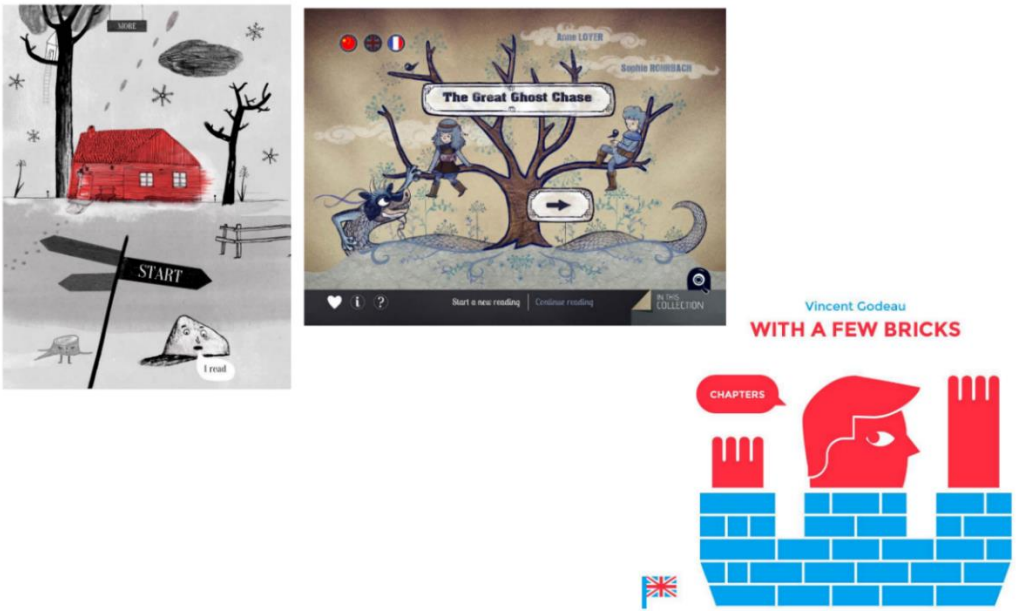

Figure 1-5: Examples of HS. From left to right, HSs of *Wuwu & Co*. (2014/2017), *The Great Ghost* Chase (2014/2014), and *With a Few Bricks* (2015/2016).

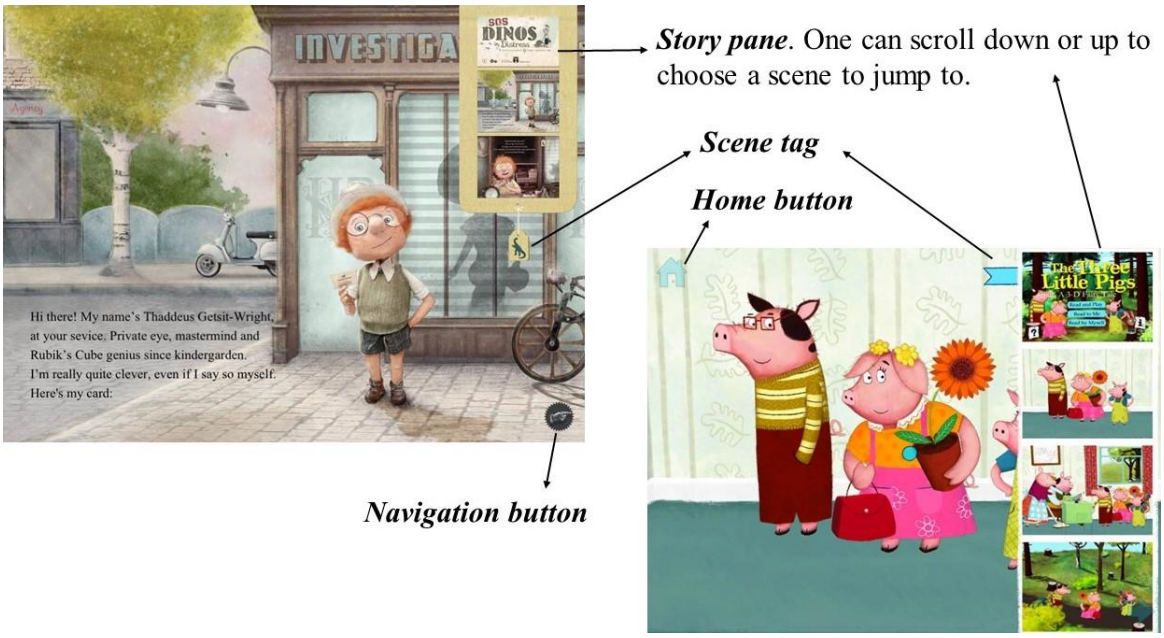

Figure 1-6: Examples of NS. From left to right, NSs of *SOS DINOS in Distress* (2013/2013), and *The Three Little Pigs* (2011/2016).

A scene in the app is different from a (double-page) spread in a picturebook, but similar to a scene in filmmaking. A scene in a film refers to:

> A segment of a feature film, which usually depicts an act happening at a single time and place and often with the same characters […]. However, sometimes, two lines of action, occurring in different spaces or even different times are included in a single scene by using crosscutting (Dhar, 2012, p.5).

Like a film scene, a *scene* in an app, first of all, is a visual and auditory entity that presents a complete unit of the story on the touchscreen device. The unit usually depicts a single action taking place in a single location. However, a scene in the app is also different from that in a film in the sense that it does not necessarily depict an action which happens in a continuous time. In addition, the action in an app scene may sometimes require human participation/interaction[5] to complete that unit of the story, although sometimes a scene may contain participatory/interactive features for the mere entertaining purpose. The participatory/interactive features include, but are not limited to, triggering *hotspots* to generate the hidden narrative content or to play in-app games. I use *hotspot* to refer to a small area with specific coordinates (for the developers) on the touchscreen. This area is coded with hidden crucial or additional narrative content such as auditory, visual and verbal elements. There are certain ways to trigger these elements, usually

[5] Participation and interaction are different, which will be fully elaborated in Chapter Two.

by the contact between finger(s) and the touchscreen.

For example, in *The Icky Mr Fox* (2012/2016), a single fabula app, there are 22 scenes. The HS (figure 1-7) looks like a title page of a printed picturebook except that it contains four hotspots:

- '**[sound]**' on the top left corner of the scene where one can tap to turn on/off the sound of the app;

- '**ickypen**' with a donkey head on the bottom left corner where one can tap to go to the homepage of the app developer;

- '**Like us on Facebook!**' with a Facebook logo on the bottom right corner where one can tap to go to the Facebook page of the developer;

- '**Begin**' with an arrow in the middle of the scene where one can tap to go to the NSs.

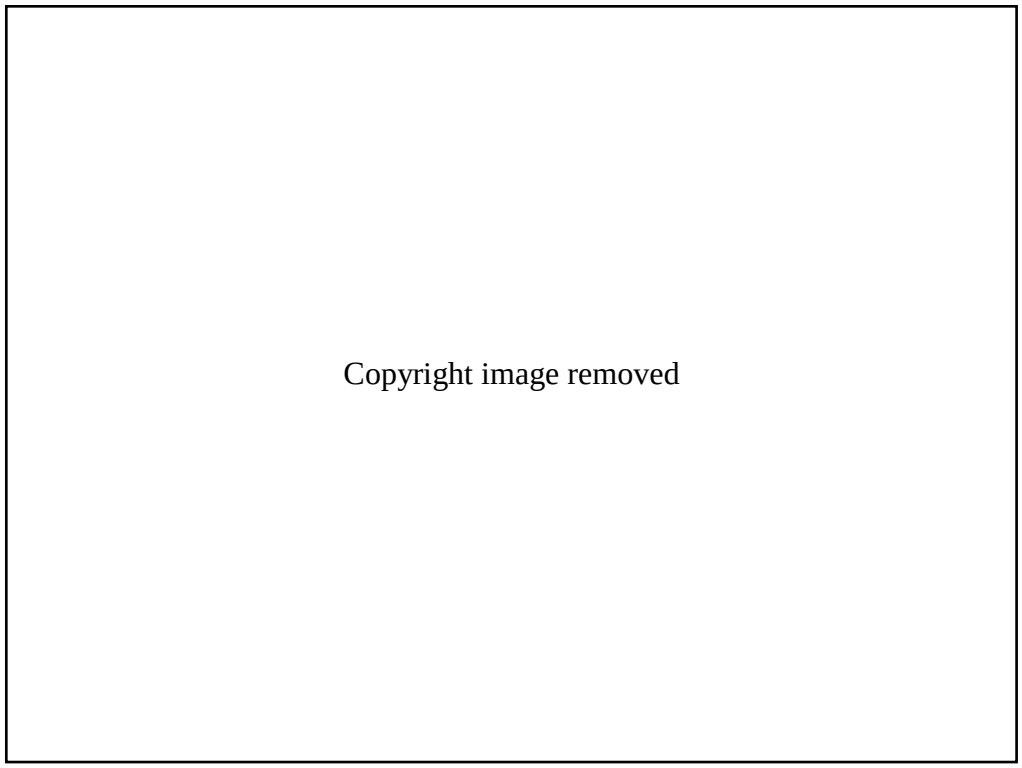

Figure 1-7: The HS of *The Icky Mr Fox* (2012/2016).

The next scene shows Mr Rabbit and Mr Mole having their afternoon tea (figure 1-8). The major differences between this scene and a page in a printed picturebook are, firstly, the images of the characters are moving instead of being still, though the movement is rather limited and repeated. Secondly, if one taps on the image of any object in this scene, one will hear the name of the object with the name written in English letters popping out simultaneously. Such a design is perhaps to help children learn to read and write, but from the perspective of narrativity, the design does not contribute much to the narration. From the perspective of entertainment, the hotspots in this scene may be entertaining and surprising to children.

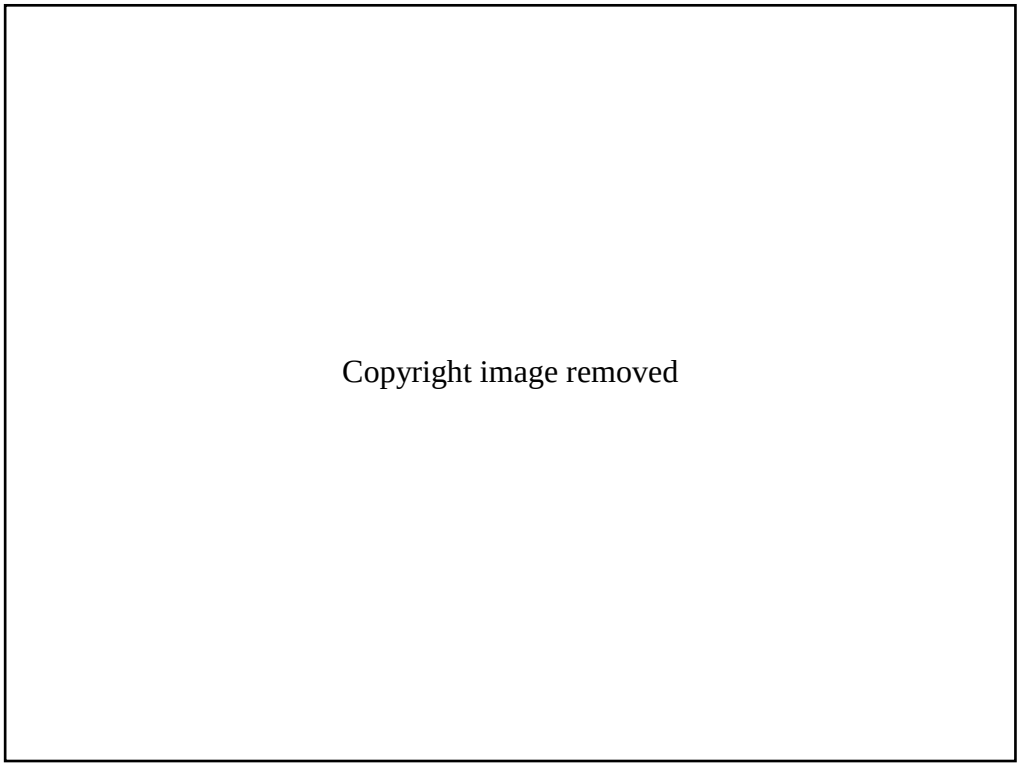

Figure 1-8: The first NS of *The Icky Mr Fox* (2012/2016).

There is another scene in the app that depicts Mr Wolf digging a tunnel leading to the house of Mr Rabbit and Mr Mole (figure 1-9). In this scene, the action of Mr Wolf digging the tunnel needs to be completed with human participation. If one taps on Mr Wolf, he will start to dig the earth for a few times before he stops. Such a hotspot design can be considered part of the story as it triggers Mr Wolf's action. By helping Mr Wolf dig the tunnel, one gets involved in the story and participates in moving the story forward, so in this scene, human participation helps to complete the unit of the story.

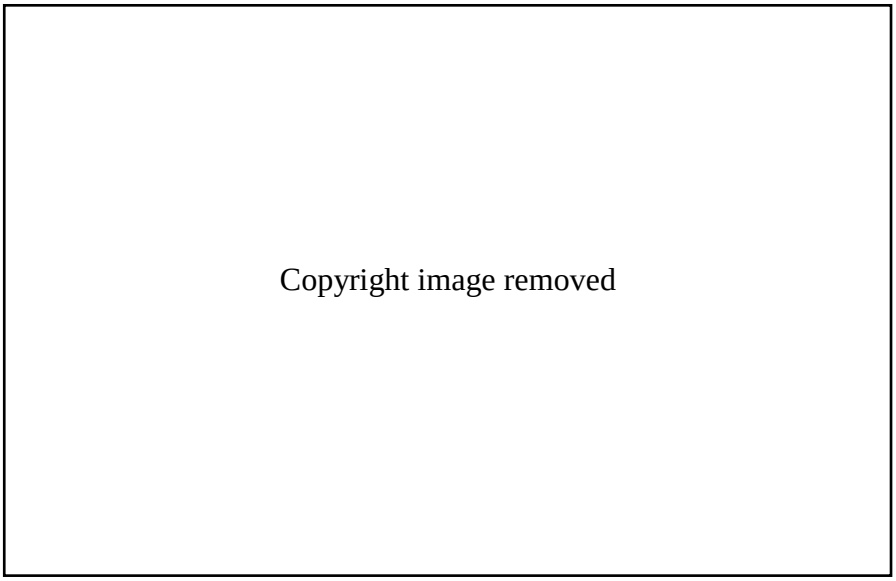

Figure 1-9: The screenshot of an NS in *The Icky Mr Fox* (2012/2016). The explicit hint 'tappy-tap' with an arrow next to the fox indicates that one should tap on Mr Fox.

A scene in the app is in fact not always addressed as such in the academic research on the apps. In the very early stage of the app studies, a 'scene' was referred to as a 'page' (e.g. Al-Yaqout, 2011), but in recent studies, researchers tend to address the digital nature of the apps and start to use 'screen' (e.g Al-Yaqout and Nikolajeva, 2015), or 'scene' (Aguilera et al., 2016; Sargeant, 2015; Schwebs, 2014). 'Scene' is a preferred term in this thesis because it is a term widely used among app developers, and it adequately addresses the dynamic feature and the complexity of the app content. 'Screen' in contrast only reflects the platform on which the scene is displayed but does not reflect what is shown on the platform, while 'page' does not address the participatory/interactive and dynamic content of the apps.

While having three basic constituents in common, namely, the LS, the HS, and the NS, the development of the apps shows three tendencies that have been showing distinctive differences from one another. Based on the chronological order of their occurrences, I name these three tendencies as *The First-Generation*, *The Second-Generation*, and *The Third-Generation*. The three generations of the apps occurred sequentially, but from then on have been co-existing in today's digital publishing industry.

The First-Generation

In the very beginning around 2010, most of the apps were released as either adaptations of printed picturebooks and illustrated books, or an imitation of print (picture)books without the

actual (picture)books having been published in print form before the release of the apps. Examples of the former are *The Cat in the Hat* (2010/2010), *Alice for the iPad* (2010/2015), *Heart and Bottle* (2010/2010), and the latter such as *The Icky Mr Fox* (2012/2016).

Some early apps keep as many features found in printed picturebooks as possible. Such attempts are, for example, trying to look like a book by having page-turning effect, or keeping a faithful copy of the content including the colour and the arrangements of words and pictures in the original (picture)books. These apps are usually designed with limited amount of basic digital elements, such as sound effect *not* linked to a hotspot, 'read to me' function, 'touch/swipe to turn the page' and 'touch to read aloud' functions. Sometimes the design concept seems to add digital elements on the original/hypothetical printed picturebooks script without deconstructing the original/hypothetical. In other words, these apps are digital immigrants. This is perhaps the reason why in the early stage of the app studies, the apps were sometimes addressed as digital picturebooks or picturebook apps due to their evident resemblance to picturebooks (e.g. Al-Yaqout, 2011; round table discussion in the 1st International Mini-Conference on Digital Children's Literature).

The digital adaptations in the digital immigrants (in the First-Generation) have some features different from the originals due to the affordances (strengths and limitations) of the digital technology. One distinctive difference is the disappearance of the double-page spread in the app. A double-page spread is either combined as one single scene or split into two or more separate scenes in the digital adaptation (see figure 1-10).

In figure 1-10, the upper picture is a double-page spread from the printed picturebook *The Heart and the Bottle* (Jeffers, 2010) while the lower three pictures are screenshots from three different sequential scenes from the single fabula app under the same name. As shown in the figure, the app separates the original double-page spread into three scenes. The verso is adapted into one scene shown in the left bottom screenshot where the human participant needs to help the girl pick up the X-ray screen from the wall and put it on her chest to show the heart, and then tap the heart to let it go into the empty bottle. The recto is separated into two scenes in the app shown in the middle and right screenshots in the bottom. In the middle screenshot, the girl appears from the left-hand side of the scene, walking to the right-hand side. In the right screenshot, the girl walks from left to right in the scene.

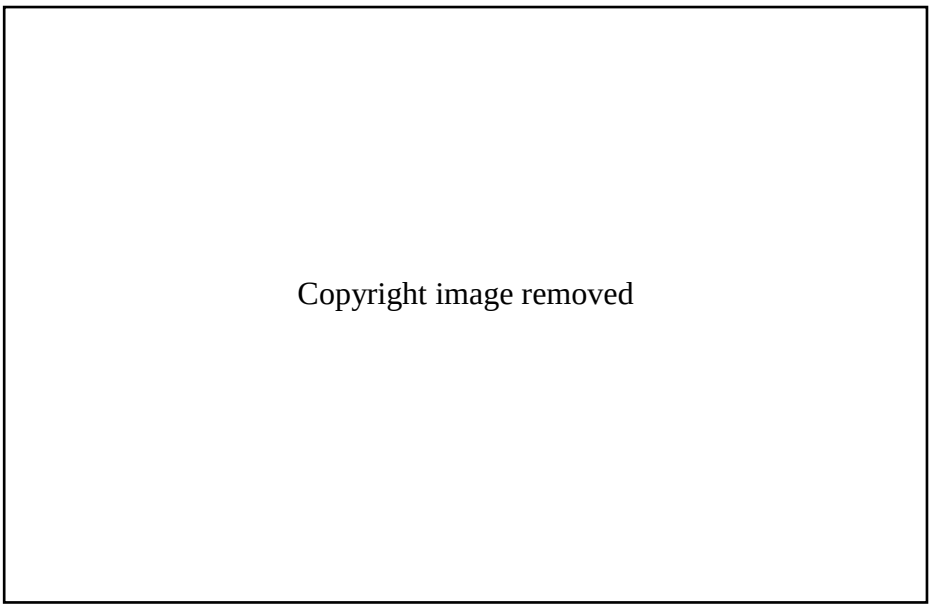

Figure 1-10: A comparison between the picturebook *The Heart and the Bottle* (Jeffers, 2010) and the app under the same name.

There is another difference between digital immigrants and the printed (picture)books: Most digital immigrants have basic cinematic elements such as special effect and sound effect, and/or basic participatory elements coded in hotspots. These elements are not normally found in printed (picture)books. In this thesis, the cinematic and/or participatory/interactive elements in the app (not limited to digital immigrants) are referred to as *décor*, a term I borrowed from filmmaking that originally refers to '[a]ll special effect or essence created in a scene by way of setting or the emotional outburst of a performer, which creates the mood of the film' (Dhar, 2012, p.5). Décor is considered as 'the most important element for construction of a scene' (ibid) in filmmaking. In the app, décor is also a crucial element for constructing the whole story, which is evident in the example of *The Icky Mr Fox* (201/2016), and will be seen in other examples discussed later in this thesis.

While some apps in the early stage seem to be designed with basic digital elements for the sake of being digital, but not much for contributing to storytelling, such as *The Cat in the Hat* (2010/2010) which copies the story exactly from page to screen, there are also apps trying to take advantage of digital technology to help narration, such as *Heart and Bottle* (2010/2010), which are on the borderline between digital immigrants and digital natives.

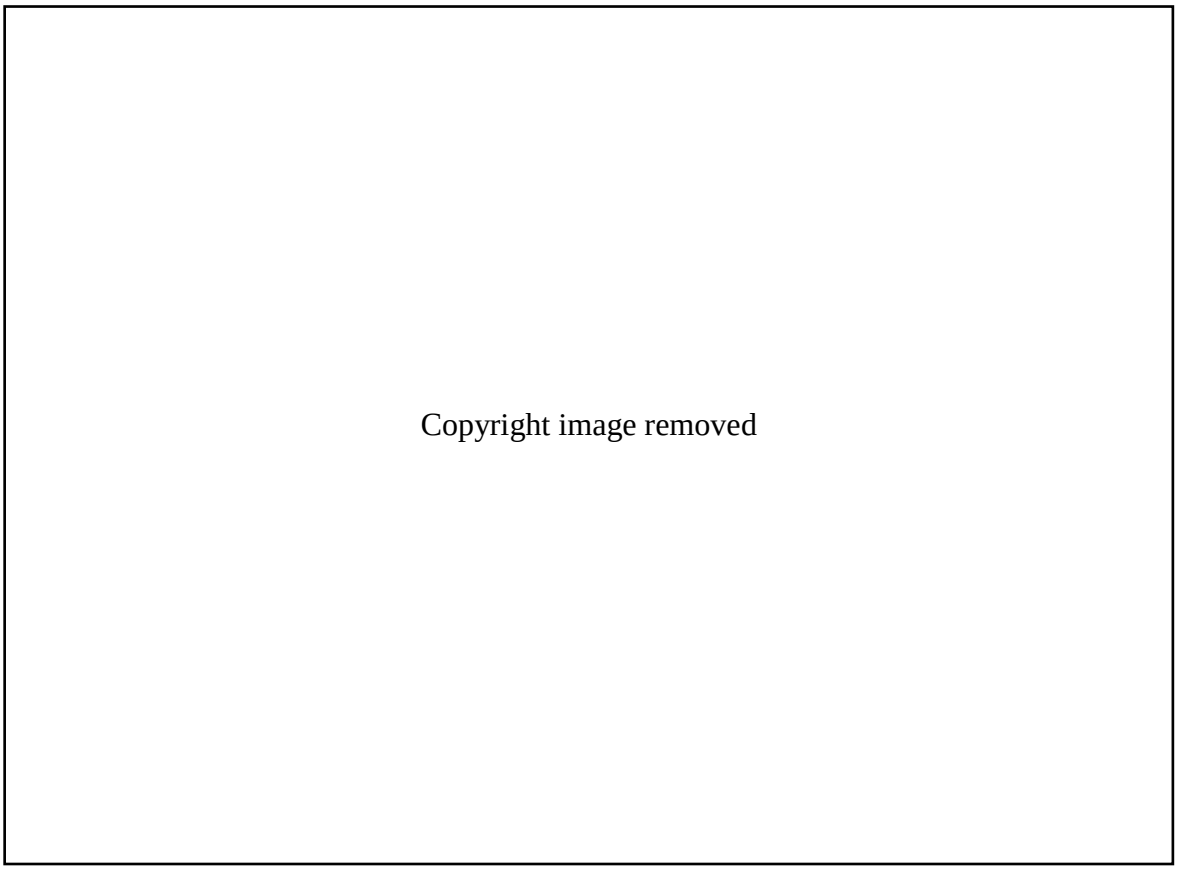

Figure 1-11: Three screenshots from *Heart and Bottle* (2010/2010).

Heart and Bottle (2010/2010) is more like a dynamic elaboration of the story presented in the printed picturebook, using animated elements and hotspots to show what happens and how things happen. For instance, figure 1-11 shows three screenshots from the app. The bottom one is the picture which is also in the original printed version. In the app, however, one will be shown to the upper left screenshot first where the little girl stands next to a measurement, with her mind picture bright and vivid. One can drag the character to let her grow in height to have the settings changed as shown in the three screenshots. While the girl is growing in height, she will change from a little girl to a teenager and finally a young woman. Her mind picture will also change from a vivid happy memory where her grandfather reads books for her to a more and more vague picture of this piece of memory until finally to an empty chair. The background colour will also change from bright to dark. The changes alongside her growth presented in the app are not depicted in the picturebook. The décor makes the original story rich, and create an effect of comparison and contrast in the growth of the girl. Such an effect may reinforce a sense of loneliness and sadness, and may strongly invoke empathy.

There are other apps like *Heart and Bottle* (2010/2010) that adopt digital techniques to tell stories previously told in the printed picturebooks. However, the presentations of the stories in these apps still largely copy the original ones in the picturebooks. If the hotspots are not triggered, the apps just look like digitised picturebooks that have mostly still pictures and words, and they need to be read from 'page' to 'page'. This means, in the early stage of the app development, there was no significant difference between the app and the picturebook in terms of presentation. Such a stage in the app development is regarded in this thesis as *The First-Generation*. In this stage, the app creators appeared to be unfamiliar with what the technology could offer, but they appeared to be trying to find a meeting point between technology and storytelling. In other words, the First-Generation is the stage where the apps did not seem to have an identity of their own yet.

The Second-Generation

The Second-Generation occurred almost parallel to the First in late 2010 to early 2011. In this generation, the app creators seemed to be unsatisfied with living in the shadow of traditional picturebooks. Such an attitude or stance was/is often seen from their company manifestos. For example, Nosy Crow, an award-winning British publisher for children, established in 2011, introduced/introduces themselves on their webpage as follows:

> We make innovative, multimedia, highly interactive apps for tablets, smart phones and other touchscreen devices. These apps are not existing books squashed onto screens, but instead are specially created to take advantage of the devices to tell stories and provide information to children in new and engaging ways. (http://nosycrow.com/about%20/ accessed on 15 August 2017)

As declared by the developers, the app design did start to move further and further away from the traditional concepts in (picture)book creation and closer to strategies used in film and computer game productions. Instead of making 'digital (picture)books', the app developers started to search for the apps' own identity. This identity searching is reflected in the birth of *digital natives*.

Digital natives reflect the app developers' research for intersections between touchscreen affordances and storytelling. Such apps bear less and less resemblance to the traditional (picture)books. One distinctive difference is that the Second-Generation has abandoned the

design of page-turning effect when such a design is not to aid storytelling but merely for the purpose of offering an assimilated book reading experience.

Specifically, for the First-Generation apps such as *The Cat in the Hat* (2010/2010), if the page-turning effect was removed, the storytelling would not be affected in any way. This means that the page-turning effect in the First-Generation does not seem to be necessary for storytelling. In contrast, in the Second-Generation apps, the page-turning effect usually constitute part of storytelling. For example, in *Lessmore* (2011/2015), a Second-Generation app, the page-turning effect can be regarded as reinforcing the theme of the app, namely, the power of book-reading.

In fact, most of the Second-Generation apps do not have page-turning effects. Instead, the developers use navigation buttons to replace the page-turning effects, and people need to tap on these buttons to move from one scene to another. The temporal gap between two scenes, i.e. the scene-shifting time, appear to have been designed into two types so far. The first type has some transitional animation, such as a flying bird in *Lil' Red – An Interactive Story* (2012/2013) (*Lil' Red* for the shortened title) (see figure 1-12). In the second type that is more commonly seen, the scene transition is seamless like the scene-shifting in films. When one taps on the navigation button, the app will show the next/previous scene straightforwardly. The vanishing of the page-turning effect in the app design marks a significant transformation of the apps because it reflects a tendency of treating the apps as something other rather than another form of (picture)books.

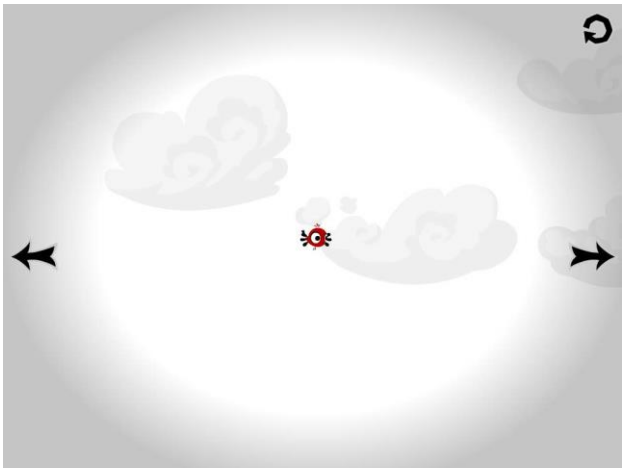

Figure 1-12: The transitional animation between two scenes in *Lil' Red* (2012/2013). When one taps on the black arrow on the right-hand side, instead of seeing the next scene straightaway, one will be led to an animation where the little bird flies into the scene from left to right and then to the next scene. If one taps on the black arrow on the left-hand side, the bird will fly from right to the left and then to the previous scene.

Another presentation difference between the First and the Second-Generation lies in the degree of dynamics. The First-Generation tends to have less dynamic scenes which, without

triggering hotspots, look almost like a digital copy of a picturebook. The Second-Generation adopts more cinematic strategies and computer game strategies, depicting scenes in motion even before any hotspots have been activated. It combines narration and ludic tasks together as video games usually do, making the story more participatory, but not necessarily better in terms of narrativity than the First-Generation.

A typical example of Second-Generation apps is *Lil' Red* (2012/2013), a single fabula app. This app uses an animated red bird (shown in figure 1-12) to link all scenes together. In each scene, there is a short animation with coded hotspots, and most of the time, one needs to figure out how to identify hotspots and trigger them based on limited hints to help the story proceed.

Figure 1-13: Three screen shots from the first NS of *Lil'Red* (2012/2013).

Figure 1-13 is a demonstration of how the hotspots work in this app. The top left screenshot in the figure depicts a little girl swinging in the garden while a hand sticking out of the door and waving at her. One needs to tap on the hand to let the story continue in the same scene. When the hand is tapped, it will signal the little girl to go close to it, as shown in the bottom left screenshot. At this point, one needs to tap on the girl to let her act; otherwise she will just stop swinging but still sits on the swing. After being tapped, as shown in the right-hand side screenshot, the girl will get off the swing and go near the hand while the hand will take out a basket full of something red and point to the right-hand direction. Meanwhile, there will be a speech bubble appearing on top of the hand, showing a basket and an arrow pointing to a house

with a sign hanging in front of a house. The sign shows a head of an old person wearing a pair of glasses. One needs to figure out that the girl is assigned with a task to deliver a basket of something red to the place shown in the speech bubble. At this point, one can tap the navigation button on the right to continue with the story. Although this app is a retelling of the little red riding hood story, one does not need to be familiar with the story to fulfil the tasks in the app.

Although the Second-Generation is more dynamic and participatory than the First, at this stage of the app development, the app design had not totally abandoned the conventions of mainstream (picture)book design. For example, there is still a sense of direction for the narrative flow in the app design, either from left to right or right to left, which is often seen in book design conventions. Such a sense of direction is evident in the existence of navigation buttons (see figures 1-12 and 1-13).

Moreover, there seems to be an 'identity crisis' reflected in the Second-Generation: the apps seem to have a bit of everything (picturebooks, films, computer games, etc.) in terms of the presentation and the way of storytelling, but meanwhile this combination of everything does not seem to co-exist harmoniously in the apps for the narrative and/or ludic purpose(s). For instance, in *Lessmore* (2011/2015), there is a scene (see figure 1-14) where one can play the song *Pop! Goes the Weasel* by tapping the correct piano keys. This game feature is entertaining but as Schwebs (2014) points out, it seems to be 'irrelevant for the narration' (p.5).

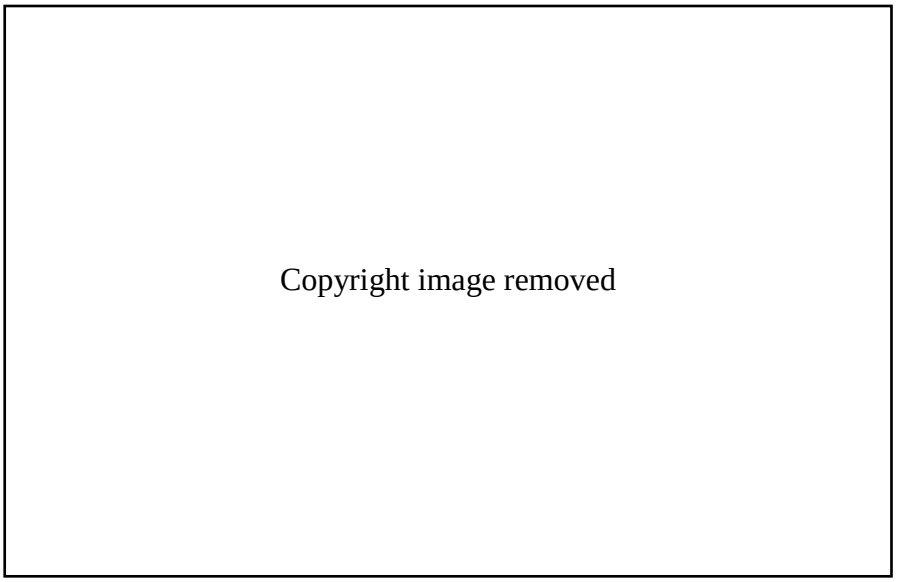

Figure 1-14: A screenshot of a scene in *Lessmore* (2011/2015).

The Third-Generation

While the First-Generation is about the app looking like a book, and the Second is about an attempt to get rid of the impression of being like a book, in the Third-Generation which has been largely (but not exclusively) seen since 2014, the app developers seem to have positioned the apps in a unique place where they have their own identity and are not simple imitations of other things such as books, films or computer games. A significant change found in the Third-Generation is the disappearance of navigation buttons, a feature belonging to the legacy of book design conventions.

The exploration of stories for the human participant in the Third-Generation tends to be mysterious, surprising and full of challenges as the visual presentation of the story is nonlinear, meaning that there is no sense of visual direction about where the narrative should or will go. For example, *The Great Ghost Chase* (2014/2014) is a multiple fabulae app[6] with game features. In this app, there are no navigation buttons. To get to another scene, one needs to find a hotspot that is a logical link between the current scene and another.

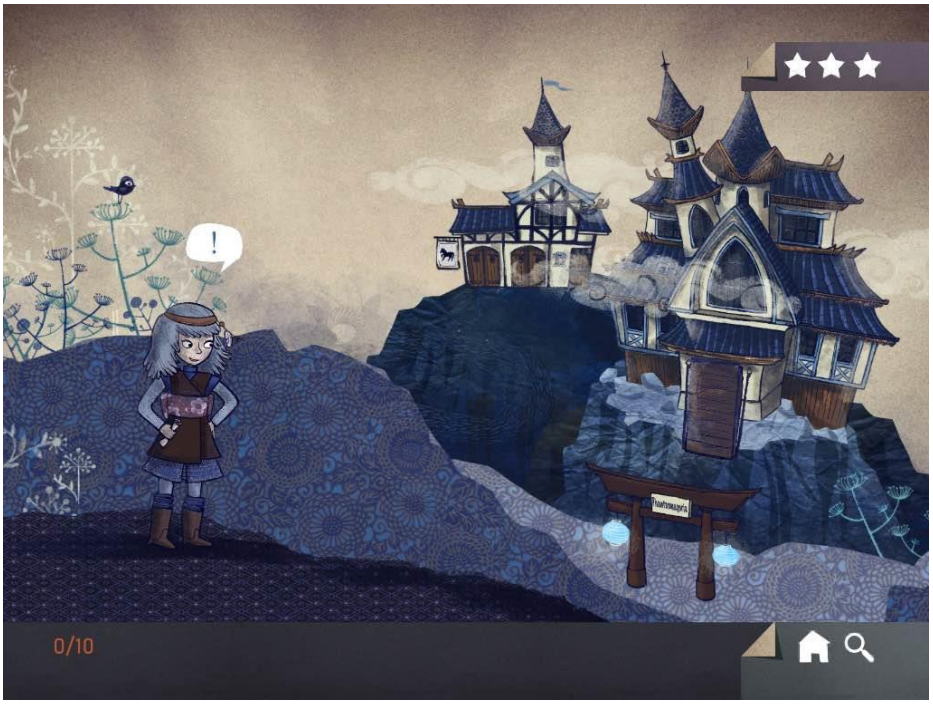

Figure 1-15: A screenshot of a scene in *The Great Ghost Chase* (2014/2014).

[6] This does not mean that all multiple fabulae apps belong to the Third Generation, nor does it indicate that there is no single fabula apps in the Third Generation.

Figure 1-15 shows a scene in the app where one needs to help the protagonist decide how to get into the castle. A logical step to go forward can be tapping either the gate of the castle shown on the right-hand side, or tapping the stable with a horse flag shown in the further back area in the screenshot. Both actions can help the protagonist leave the current scene but end up in two different scenes respectively. If one gets stuck, one can tap the magnifying glass button next to the home button to get a vague hint.

Besides having no navigation buttons, the design in the Third-Generation sometimes blurs the borderlines between scenes, and in some cases, may even break the borderlines. Such an example can be seen in the app *With a Few Bricks* (2015/2016) (see figure 1-16). This single fabula app has very smooth transitions from scene to scene, which barely disturbs the story development. It may be argued that the transitions are also part of the story.

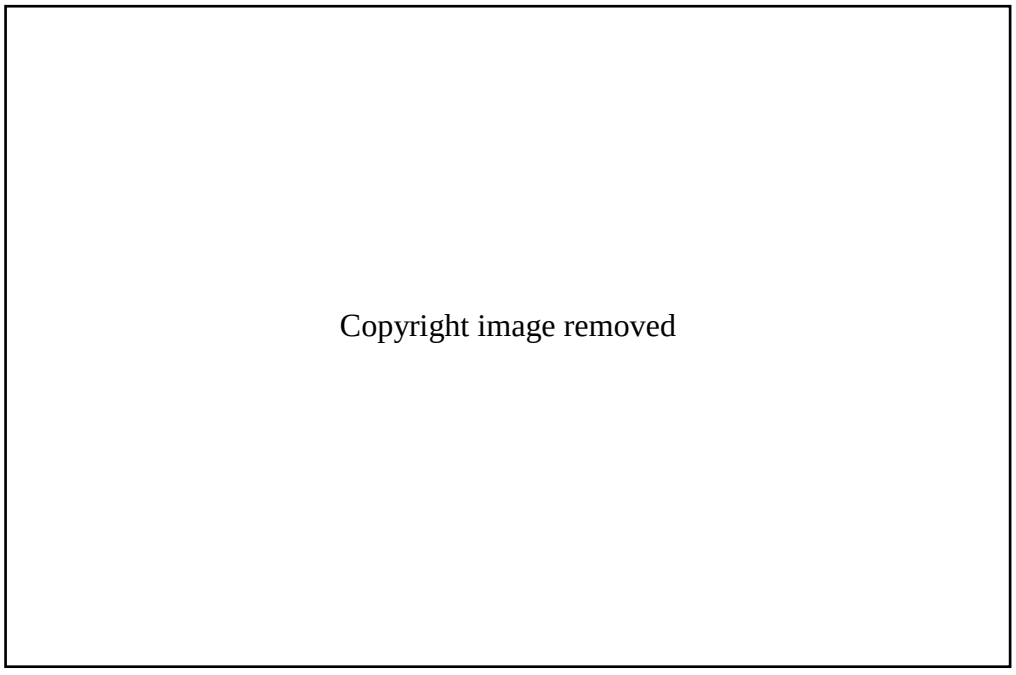

Figure 1-16: Three screenshots of two NSs in *With a Few Bricks* (2015/2016). The two screenshots on the left belong to one NS, and the one on the right is the following NS.

Specifically, as shown in figure 1-16, the screenshots on the left depict a scene where the protagonist finds himself crying and tries to find where the tears come from. In the top left screenshot, there is a line saying, ‘TOUCH MY EYE’, against the blue background. If one touches the eye of the protagonist’s, there will be a big drop of blue tear falling from it. If one continues to open wide the eye as directed in the bottom left screenshot, the eye will be widened

so much that to some point the blue pupil will occupy the whole screen. This pupil will then turn into a drop of blue tear that can be traced all the way up to a castle in the protagonist's heart shown in the screenshot on the right-hand side which appears in a different scene.

It is not easy to describe something in motion accurately in words. One may need to see the app in real to fully understand how the transition works. However, through my simple description, one may get the idea that in this app, the story moves without disruption from the beginning to the end with transitions serving as part of two connecting NSs (which are part of the story). Such transitions can be hardly recognised if one is not familiar with every page in the book *Avec quelques briques* (Godeau, 2014) from which this app adapts.

From *With a Few Bricks* (2015/2016), we can see the remarkable change in app design from the First to the Third-Generation. As an adaptation app, unlike *The Cat in the Hat* (2010/2010) in the First-Generation, or *Heart and Bottle* (2010/2010) that sits on the borderline between the First and the Second-Generation, *With a Few Bricks* (2015/2016) does not bear any resemblance of a book, nor does it copy the original picturebook page by page. Instead, it transforms picturebook storytelling to a truly digital storytelling with the aid of modern technologies. Examples of non-adaptation apps in the Third-Generation can be found in *Wuwu & Co*. (2014/2017), and *David Wiesner's Spot* (2015/2015) (*Spot* for the shortened title). In short, these apps fuse entertainment and storytelling together. The narrative strategies adapted from various media are used to smooth and strengthen storytelling rather than disturbing it. Till the Third-Generation, the app seems to have truly gained a unique position in the story world, and thus might be regarded as a story genre of their own.

So far, there seems to be a thriving market for the apps. The flourishing of the apps earned them a place in a variety of international children's book fairs, such as the Bologna Children's Book Fair, the Montreuil Children's Book Fair and the Frankfurt Book Fair. Some children's book awards have also been set up with categories for the apps such as BolognaRagazzi Digital Award, UKLA (the UK Literacy Association) Digital Book Award, The Digital Book Awards, and Digital EHon Award. The market, book fairs and book awards have helped to establish quite a few 'brand names' among app developers, such as 'Nosy Crow' in the UK, 'Moonbot Studios' in the USA, and 'La Souris Qui Raconte' and 'E-Toiles' in France.

Naming the Apps

Within the digital market and mass media, where app developers, reviewers, reporters, bloggers, book awards, book festivals and news agencies are concerned, there are multiple names given to the subject of the study. Table 1-1 shows some representative terms collected from the app review websites, media reports, and the developers' descriptions of the apps accessed by this study. What seems to be reflected from this table is a lack of consensus in naming the app in the non-academic world. Their terminologies for the apps seem to derive from three word roots, namely, *app*, *story* and *book* (see figure 1-17). No matter what the app is called by the general public, most of the developers listed in Table 1-1 seem to highlight the interactive feature of their apps.

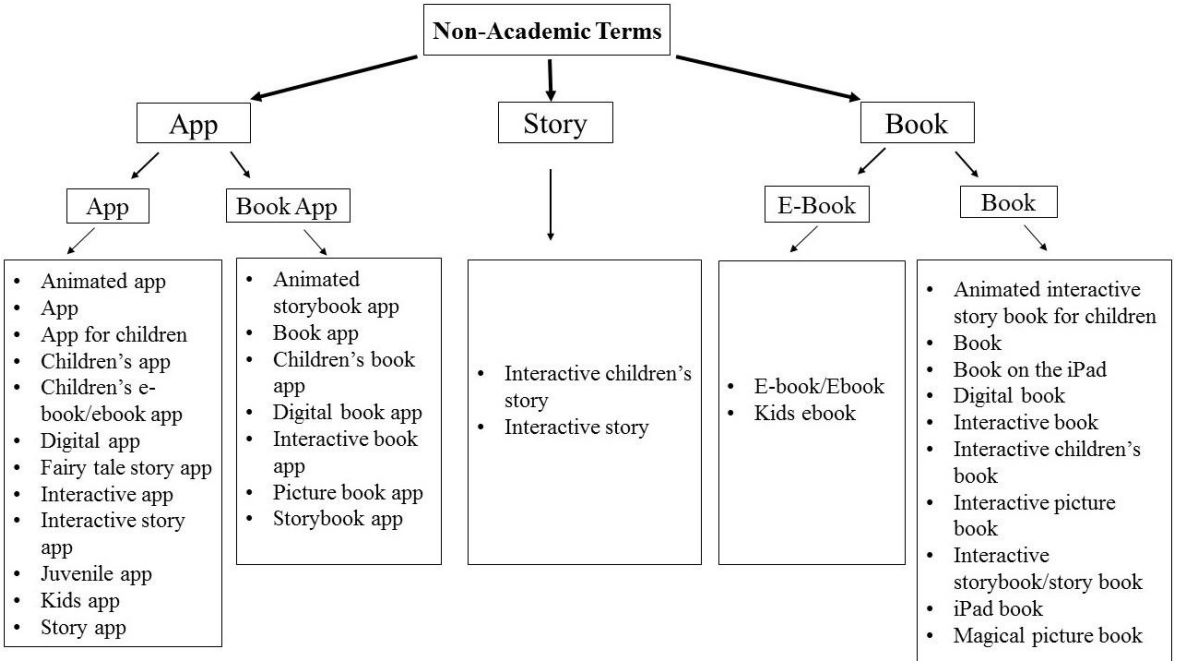

Figure 1-17: Non-academic terms for the app.

Term for the Apps	Representative Addressers
Animated app	Disney
Animated interactive story book for children	ICKYPEN
Animated storybook app	Sesame Street

App	American Association of School Librarians; BestKidsApps.com; Bologna Ragazzi Awards; Kirkus Reviews; Gadgetbox; Moonbot Studios; Nosy Crow; Random House LLC; Rosa Golijan from MSNBC; *USA Today*
Apps for children	BBC; The Guardian
Book	Book Turst; Digital-Storytime.com; Giggle Apps Review; iStorytime; La Souris Qui Raconte
Book app	Appy Awards; Digital Storytime
Book on the iPad	The New York Times
Children's app	Nosy Crow; FutureBook
Children's book app	FutureBook; *The Guardian*
Children's e-book/ebook App	Daniel Donahoo from WIRED.com; John Pavlus from Fast Company
Digital app	Digital Storytime
Digital book	La Suris Qui Raconte
Digital book app	Loud Crow Interactive Inc.
E-book/Ebook	Digital Storytime; KAPi (Kids at Play Interactive) awards; Kids Book Review; La Souris Qui Raconte
Fairy tale story app	Nosy Crow
Interactive app	Loud Crow
Interactive book	HarperCollins Publishers Ltd; Wales Interactive Ltd
Interactive book app	Oceanhouse Media; *The Guardian*
Interactive children's book	Step In Books
Interactive children's story	Nosy Crow
Interactive picture book	HarperCollins Publishers Ltd; Slap Happy Larry
Interactive story	Brian Main; La souris qui raconte; Wales Interactive Ltd
Interactive story app	Teamtreehouse.com
Interactive storybook/story book	Apps4kids games UG; Pablo Curti; Sesame Street;
iPad book	Jordan Golsen from Mac Rumors.com
Juvenile app	Digital Book World
Kids app	iLounge
Kid's ebook	Rebecca J. Rosen from The Atlantic.com

Magical picture book	BoingBoing; Step in Books
Picture book app	Digital Storytime; Nosy Crow
Story app	Junior Design Awards; Moonbot Studios; School Library Journal*; The Independent*;
Storybook app	Billy's Booger Storybook; Moonbot Studios; Nosy Crow; Sesame Street

Table 1-1: Non-academic terms and addressers for the app.

Academically, there is no consensus on how to name the subject of the study either. In general, the academic terms come from two word roots: *app* and *e-book* (see figure 1-18). No matter whether the apps are investigated in terms of digital literacy education or studied as what they are, they are named based on two representative groups of opinions. A fundamental divergence of opinions[7] lies in the question of whether to regard these apps as digital extension of picturebooks. One group of researchers, who seem to be keen to develop picturebook theory to tackle issues found in the app, address such apps as 'digital picturebooks/picture books', 'picturebook/picture book apps', or 'apps' for short (e.g. Al-Yaqout, 2011; Al-Yaqout & Nikolajeva, 2015; Mackey, 2015; Serafini, Kachorsky, & Aguilera, 2015 & 2016; Yokota, 2012 & 2013; Yokota & Teale, 2014). The other group is calling for interdisciplinary research on various aspects of the app and therefore appear to avoid relating the term 'picturebook' closely to the subject of the study. Instead, this group address the apps as 'book apps', 'storybook apps', 'story apps' or 'narrative apps' (e.g. Stichnothe, 2014; Sargeant, 2013 & 2015; Turrión, 2014 & 2015; Wolf, 2014; Zheng, 2016). There are also some other researchers that use 'picturebook/picture book app', 'book app' and 'app' interchangeably (e.g. Schwebs, 2014; Wooten & McCuiston, 2015). In addition, there are some other researchers who refer to these apps as 'electronic storybooks' or 'e-books' with various prefix such as 'interactive animated e-books' or 'interactive picture e-books' (e.g. Bus, Takacs, & Kegel, 2015; Hoffman & Paciga, 2014; Schugar, Smith, & Schugar, 2013; Smeets & Bus, 2015).

[7] The divergence of opinions was highlighted in the International Minisymposium of Digital Literature for Children, held in Cambridge-Homerton Research and Teaching Centre for Children's Literature, at the University of Cambridge, on 6 March 2014. Two different opinions were led by Maria Nikolajeva and Celia Turrión respectively. Nikolajeva was for studying these apps from picturebook theory perspective, and thus inclined to call them digital picturebooks, or picturebook apps, or apps for short. Turrión, however, believed that relating picturebook with apps in the name will limit the scope of app research in children's literature. She preferred to call these apps 'book apps' at the time.

Comparing figures 1-17 and 1-18, one may find that it seems to be a phenomenon to use ‘app’ and ‘e-book’ interchangeably in academic studies as well as in the app market and media report. Although theoretically speaking, the researchers who use the term ‘e-book’ do not hold fundamentally different opinions on app studies with those who refer the apps as ‘apps’; technically speaking, however, e-books and apps have fundamental differences.

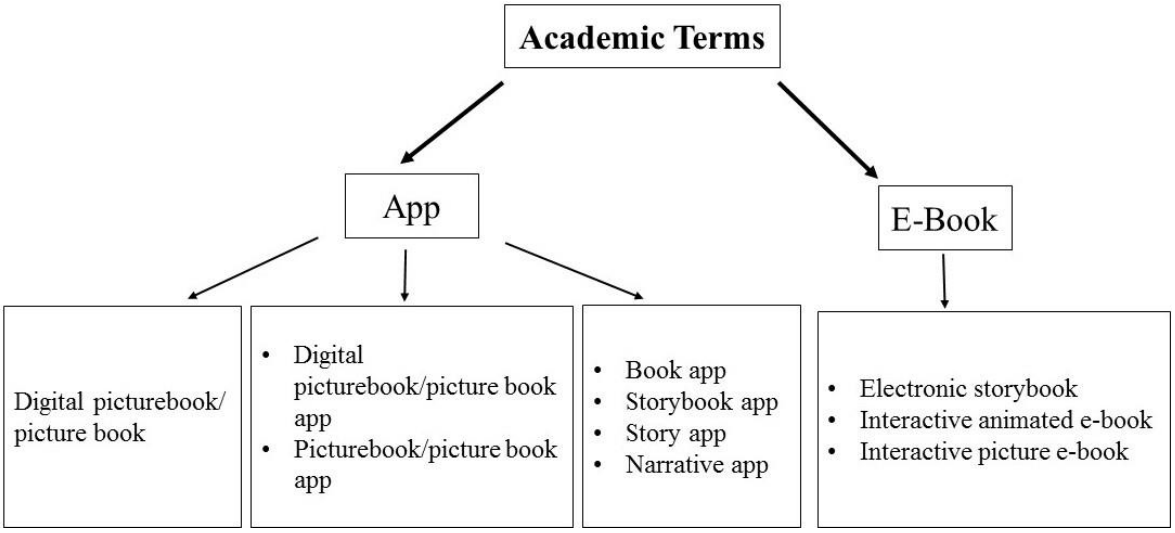

Figure 1-18: Academic terms for the app.

Apps & E-Books

All those listed in Appendix A are apps in nature, but they are referred to sometimes as e-books as shown in figures 1-17 and 1-18. An app and an e-book are technically different. An app is a piece of self-contained software as introduced in 1.3.1; an e-book is not. According to Vassiliou and Rowley (2008) and Garrish (2011):

(1) An e-book is a digital object with textual and/or other content, which arises as a result of integrating the familiar concept of a book with features that can be provided in an electronic environment.

(2) E-books, typically have in-use features such [as] search and cross reference functions, hypertext links, bookmarks, annotations, highlights, multimedia objects and interactive tools. (Vassiliou & Rowley, 2008, p.363)

“Ebook” […] is just an abstract term used to encompass any electronic representation of a book, and includes formats such as PDF, HTML, ASCII text, Word, and a host of others, in addition to EPUB. (Garrish, 2011, p.1)

As Vassiliou and Rowley (2008) explain in their paper, the first part of their definition summarises ‘the essential and reasonably stable nature of e-books’ while the second part is anticipated to ‘become less relevant over time and require ongoing revision’ due to technology development (p.364). While Vassilou and Rowley’s definition suggests a multimedia tendency of the e-book development, Garrish’s definition focuses more on the variety of e-book formats in today’s digital market.

Based on these two definitions, one may safely draw two conclusions about an e-book. Firstly, an e-book is not an app, a distinction also made by Sargeant (2015). To be specific, an e-book is a digital file that needs to be read from an application or an e-book reader that supports its specific format (for e-book reader, see Griffey, 2010). For example, a PDF file needs Adobe to open it, a HTML file needs a web browser, an MS Word file needs Microsoft Word, a Kindle book file needs Kindle app or Kindle device, and an iBook needs iBook app.

Once knowing the technical difference between an e-book and an app, one may find two practical ways to distinguish them in one’s computational devices: [1] where the digital product is obtained, and [2] how to open it. Specifically, anything that is downloaded directly from an app store is definitely an app, while an e-book cannot be obtained directly from an app store, but often through an app or an e-book store such as Amazon Kindle store. When trying to open the product, one may notice that an app can be opened directly by tapping the app icon on the screen; as for an e-book, one needs to firstly open the app that contains the e-books, and secondly tap the e-book icon that one wishes to read. For example, *Me Books* (Me Books, 2012/2015) is an app for children that can be downloaded for free from Apple App Store. This app alone does not contain any stories. Story books need to be purchased through this app. The story books provided by *Me Books* (2012/2015) app are e-books. The following is a demonstration of how to read an e-book in *Me Books* (2012/2015) app, which may also show the difference between an app and an e-book (see figure 1-19).

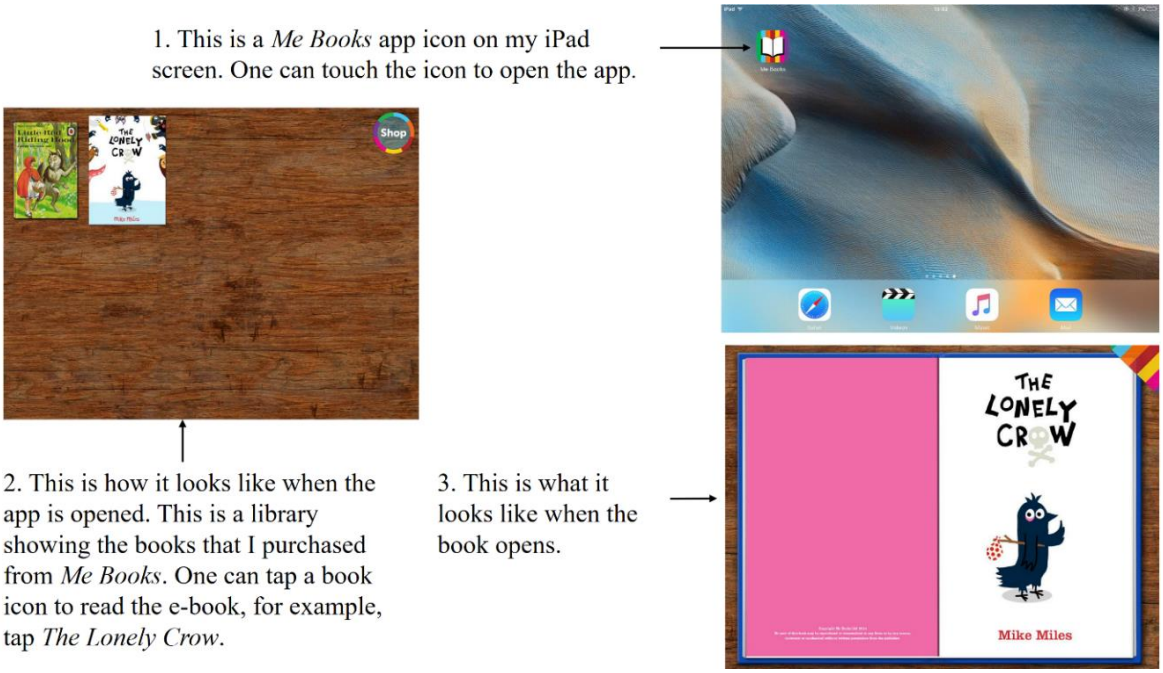

Figure 1-19: A demonstration of how to read an e-book via *Me Books* (2012/2015).

The second conclusion that may be drawn from the definitions of an e-book is that an e-book can be participatory or interactive to various degrees depending on the design. For example, simple 'written' sign based e-books such as Kindle books involve low level participation, but an enhanced e-book that is embedded with multimedia content can be highly participatory or interactive (for enhanced e-books, see Bullock, 2010; Colombo, Landoni, & Rubegni, 2012).

When comparing an e-book with a 'book app', Sargeant (2015) concludes that e-books 'contain […] low levels of interactivity' while '[b]ook apps […] incorporate higher levels of interactivity' (p.461). This statement is debatable. First of all, there is still a question whether interactivity does exist in all e-books and book apps, or in other words, there is still a question whether to call the nature of hotspots participatory or interactive (which will be further discussed in Chapter Two). Secondly, some e-books such as *The Lonely Crow* (Miles, 2014) may be considered as participatory/interactive as or even more participatory/interactive than some apps such as *How Far is Up?* (2014/2014) considering that the e-book and the app in the examples are both embedded with moderate level of auditory content while the e-book allows the reader to change the original auditory content with self-recorded one but the app does not.

So far, it has been demonstrated that an e-book and an app are technically different, but apart from that, they are not essentially different in involving human exploration of the story.

Therefore, it may not be necessary to study the two separately. For the sake of argument though, this thesis will only focus on the app.

Apps & Picturebooks

A comparison between figures 1-17 and 1-18 also shows that the apps are often related to picturebooks in both academic discussions and in marketing. The stance in this thesis is that the relationship between the apps and picturebooks is more like an evolutionary transition. In the section where the development of the app was reviewed, it has been demonstrated how the First-Generation and the Second-Generation apps had been influenced by (picture)books conventions. Therefore, it may not be fair to separate the apps and picturebooks totally. However, the characteristics of the Third-Generation reflect the birth of an artefact that seems to be unique in its own style and genre, and therefore it may also not be fair to attempt to colonise the apps as picturebooks.

There are two reasons for treating the apps as a unique genre other than picturebooks. The first reason is that the app and the picturebook are different in nature, one being software, and the other, book. The technical differences lead to other differences from making the artefact, presenting it, and experiencing it.

For instance, in terms of the making, to develop an app, it usually involves a variety of expertise, most of which are not needed in the making of the picturebook. Based on the credit list in the apps, the following list shows a rough idea of the kind of people being involved in the making of the app:

- Author(s) and illustrators
- Graphic designer
- Computer engineers
- Audio producers
- Sound editors
- Music composers/producers/director
- Dubbing actors/actresses
- Directors of scenes
- App producer

In terms of the presentation, a picturebook is, first of all, a print artefact. According to Pattison (2013) and Salisbury (2004), a picturebook tells stories in a manner of using usually 16 double-page spreads apart from two covers, two pieces of end paper, a spine listing the author, title and publisher, and may or may not have a dust jacket wrapping around the book with flaps that have a synopsis of the book and an author biography. Most importantly, a picturebook conveys messages by the interdependence of and the interplay between words and pictures (e.g. Bader, 1976; Meek, 1988; Nodelman, 1988; Salisbury and Styles, 2012). In other words, it depends on 'the combination of two levels of communication, the visual and the verbal' (Nikolajeva and Scott, 2001, p.1).

Compared with the picturebook, the app is distinctively different in presentation based on the elaboration in the section of 'The Development of the App: The Presentation', and it is an integration of verbal, visual, auditory communications that usually invites various degrees of physical participation. One may want to argue that picturebooks have flexibility and adaptability as demonstrated by Lewis (1996), and that their format may vary or sometimes break the norm. However, when a picturebook has evolved into software, it cannot be called a book or picturebook anymore, and might not be treated as such either, as the medium of storytelling and the affordances of the medium have changed dramatically.

In terms of experiencing the artefact, a multimodal perspective can successfully demonstrate the differences between experiencing a story by holding/tapping on a tablet computer and by holding a book, not to mention the physical participatory differences residing in both artefacts. This is, however, by no means to prioritise either artefact, as each has some affordances that cannot be afforded by the other.

To summarise, I list a few basic similarities and differences between the app and the picturebook in Table 1-2. Although the list does not reflect all the aspects of the app and the picturebook, it might be enough to show that the app is different from the picturebook. Naming the app after 'picturebook' or 'book' is likely to narrow our understanding of what the app is and how it may work.

	App	Picturebook
Nature	Software	Book
Format	Digital	Print
Layout	Single screen	Double-page spread
Medium	touchscreen	paper
Size	Standardised screen sizes	Various
Weight	Standardised	Various
Texture	Standardised (at the moment)	Various
Temperature	Cold, while getting warm when the device runs for too long	Cold, while getting warm when the hands hold for too long
Smell	None (at the moment)	Different paper fragrance (if added); humid or other smell depending on the storing place
Main creators	Authors, illustrators, computer engineers, graphic designers, audio producers, sound editors, music composers/producers/director, dubbing actors/actresses, directors of scenes, app producer, to name a few	Authors & illustrators
Content	Dynamic participatory/interactive	Still
Affordances	Verbal, visual, audio, participatory and interactive aspects	Verbal, visual and sometimes participatory aspects

Table 1-2: A comparison of some basic features of the apps and picturebooks.

Narrative app

It has been discussed that ‘e-book’ is a term that is technically incorrect for the subject of the study, while inserting ‘picturebook’ or ‘book’ in the name may restrict our understanding of the subject of the study, which leaves the term ‘story app’, ‘narrative app’ and ‘interactive (children’s) story’ from figures 1-17 and 1-18 for consideration.

First of all, it might not be rigorous to use the term ‘interactive’ to describe the subject of the study before we have a clear definition of what interactive means. Most of the studies on the apps use the term ‘interactive’ in a self-evident manner, but in fact, the term has no consensus meaning in the discourse of digital literature and communication. Secondly, as mentioned early in section ‘What is the App?’, the apps are software designed to tell stories to children for various purposes, which means that the name given to the apps should reflect two intrinsic aspects of the app: the aspect of being software, and the aspect of storytelling. It seems that both ‘story app’ and ‘narrative app’ can successfully address the two aspects. However, in

narratology, there are distinctive differences between narrative and story. Based on different schools of opinions in narratology studies, a narrative consists either of ‘story’ (what happens) and ‘discourse’ (how it is told) (e.g Chatman, 1975), or of ‘fabula’ (what happens) and ‘story’ (how it is told) (e.g. Bal and Boheemen-Saaf, 2009). From the perspective of narratology, the aspect of storytelling in the apps corresponds with ‘narrative’ as it concerns both what is presented and how it is presented. Therefore, to avoid confusion, I will adopt *narrative app* to address the subject of the study in this thesis.

Conclusions and Implications

This chapter has presented a basic context of the research, where the subject of the study, *the narrative app,* has been defined and named, and some necessary vocabularies for a shared discourse of narrative app studies have been established. The purpose of this Chapter is to set up some clear criteria to recognise a narrative and to distinguish it from other narrative forms. It has been suggested that the nature of the narrative app is a kind of storytelling in the software format. Therefore, its *software aspect* and its *narrative aspect* may require equal attention.

The software aspect of the narrative app has been explored in this chapter through consulting scholarship in computer science, where it has been suggested that the narrative app has technical difference from an e-book or a picturebook and therefore may distinguish itself from them. Its narrative aspect has been explored basically from a direct-vision perspective, that is, from what was directly perceived through the senses, this chapter has presented a picture of what the narrative app looked/looks like. This exploration of its textual presentation has identified three distinctive stages so far in the development of the narrative app. This development reflects a transition of the design concept which has moved from seeking inspiration from the picturebook design convention to exploring innovative forms of literature that may be unique to digital storytelling.

The experimental presentation ideas shown in app storytelling so far have reflected some intertwined features. Some of the features are evident in some other media such as animations, video games, and picturebooks. However, the heterogeneity of the narrative app distinguishes it from other forms of literature despite the fact that they all seem to have something to claim in the narrative app. This heterogeneity suggests that to develop a thorough understanding of the narrative app, a wider scope and an interdisciplinary approach may be needed.

To continue developing the understanding of what the narrative app is and how it tells stories, the rest of the thesis will proceed the exploration with two other perspectives. Firstly, the narrative app will be explored as a literary form from a theoretical point of view. Secondly, it will be investigated as a software and a commercial product from a practical perspective to compensate the theoretical understanding.

To study the narrative app as a literary form, there is a matter needs to be attended to beforehand. In the account of the narrative app development, this chapter has presented a group of frequently appeared terms that centre the concept of ‘interactivity’. Interactivity appears to be a key word often associated with the characteristics of digital storytelling. However, despite the widespread acknowledgement of the term commercially and academically, there seems to be little explanation of what it is in the studies of the narrative app. Outside children’s literature, there is also little agreement on the definition of interactivity. To understand what the narrative app is and how it works, it is necessary to have a clear definition of this key word beforehand. Therefore, the next chapter will be used to inspect the nature of interactivity from a theoretical perspective.

Chapter Two: Interactivity

> *Unless we have a better understanding of the nature of interactivity, any claims about the nature of interactive artworks or the effects of interactivity on audiences will be suspect.*
>
> (Smuts, 2009, p.53)

Introduction

In Chapter One, it has been pointed out that in both commercial and academic understandings of the narrative app, a concept frequently appears, that is 'interactivity' (e.g. Aguilera, Kachorsky, Gee and Serafini, 2016; Aliagas and Margallo, 2017; Al-Yaqout and Nikolajeva, 2015; Serafini, Kachorsky and Aguilera, 2016; Stichnothe, 2014). Some researchers in children's literature and education even consider 'interactivity' a 'defining feature' of the narrative app (Zhao and Unsworth, 2016, p.91).

Although many seems to have their preconceptions when talking about the term, very few define it in children's literature. In other disciplines considering computer-mediated communication, there is no clear consensus on what interactivity means exactly. Despite its ambiguous definition, scholars from communication studies, digital literature, and education have repeatedly suggested the significance of interactivity. For instance, McQuail (2010) regards interactivity as a key term of new media discourse. Cover (2016) argues that interactivity challenges the concepts of authorship, audience and text (in the sense of signs). Aliagas and Margallo (2017) believe that interactivity together with multimodality brought by e-reading devices are changing the nature of children's literature (p.45). However, as Smuts (2009) remarks:

> While everyone seems to have something to say about the significance of interactivity, no one seems to have a clear understanding of just what makes something interactive […] Unless we have a better understanding of the nature of interactivity, any claims about the nature of interactive artworks or the effects of interactivity on audiences will be suspect. (p.53)

With the growing commercial and academic interests in 'interactive' products for children, a

theoretical hole of interactivity inquiries in children's literature appears to be outstanding and need to be filled urgently. Therefore, to build a well-grounded theoretical base for this study of the narrative app, this chapter will be used to tackle the issue of interactivity from two aspects, specifically:

- What is interactivity in the context of computer-mediated communication?
- Is it used appropriately in narrative app research? Or, can narrative apps interact?

The term interactivity appears in various disciplines[8]. Due to the nature of different disciplines, it may be unrealistic to aim for a universal definition of interactivity. However, among various disciplines in social sciences and in natural science, there seems to be an overlapped understanding, that is, interactivity is a concept associated with communication in the broadest sense (e.g. Barry and Doherty, 2016; Rafaeli, 1988; Seifert et al., 2008; Wiener, 1948). Moreover, there are three terms often associated with interactivity studies. They are 'interact', 'interaction', and 'interactive' (e.g. Cover, 2016; Ryan, 2006; Ryan, 2015; Smuts, 2009). According to Oxford English Dictionary, despite the fact that 'interact' (Anon, 2017b), 'interaction' (Anon, 2017c) and 'interactive' (Anon, 2017d) had been used in English language about a century ago before the invention of the computer, the word interactivity 'is now associated more generally with digital communication rather than with specific technologies as in the past' (Barry and Doherty, 2016, p.2). Specifically, it was from early to mid-2000s, according to Cover (2016), that the term became popular, 'being used to describe all digital communication generally, as a "selling point" of digital commodities and technologies' (p.71).

Considering narrative apps are digital commodities relying on digital technology, and the purpose of this thesis is to understand the communication between the narrative app and human, it seems only reasonable for this thesis to develop an understanding of interactivity in the context of *computer-mediated communication* between human and machine, particularly from the perspective of communication effectiveness and information control. Moreover, as Bucy (2004) comments, if interactivity is 'to succeed as a concept, it must have some meaningful social and

[8] For example, in physics, one of the earliest key discussions related to interactivity is found in Wiener's book *Cybernetics: Or, Control and Communication in the Animal and the Machine* (1961). In addition, discussions about interactivity can also be found in social psychology (e.g. Ross, 1908), narratology (e.g. Ryan, 2001 & 2015), communication studies (e.g. Rafaeli, 1988), game studies (e.g. Aarseth, 1997), and media studies (e.g. Manovich, 2001), to name a few.

psychological relevance beyond its technical status' (p.373). Therefore, this study of interactivity will also examine the concept under social and psychological lenses. The words 'interact', 'interaction' and 'interactive' will be used and discussed under the same context. In addition, the consulted literature on the interactivity studies in this thesis are those that have specifically claimed in their titles, introductions or abstracts that their purposes of studies are to understand or to define interactivity.

Under these circumstances, the question of what interactivity is will be approached with a philosophical method proposed by Smuts (2009). In his enquiry about the meaning of interactivity, Smuts suggests:

> [T]he definition should be in accord with our best intuitions on how the term should be used; and it should usefully differentiate interactivity from related but incompatible concepts with which it is often confused. (p.53)

Based on Smuts' method, I will firstly problematize the formal definitions of interactivity proposed in previous studies, and then construct a definition that can solve all the problems raised. Based on this definition, I will continue exploring the nature of interactivity by distinguishing it from a list of related concepts, and finally to identify and examine the connection between interactivity and the narrative app.

What is Interactivity? – Problematizing the Definitions

The Problematic Tendency

There appears to be a problematic tendency in interactivity research: most of the definitions claimed to be of interactivity are suspiciously of something else as they do not define interactivity directly, but question what 'interaction' is[9], what 'interacting with' is[10], or what

[9] For example, Svanæs (2000) says in the very beginning of his book, '"*What is interaction?*" […] The present work can be seen as my attempt at answering it' (p. vii) despite the title of the book is *Understanding Interactivity*.

[10] For example, Smuts (2009) posits that 'I base my definition [of interactivity] on the notion of "interacting with"', and then moves on to give a definition of interactivity as 'to be interactive, something must be responsive in a way that is neither completely controllable nor completely random' (p.54). Unless he suggests that interactivity is a synonym of 'to be interactive' or 'interacting with', Smuts' definition cannot be considered as one of interactivity.

'interactive' is[11]. Such ways of defining the term causes confusion in understanding the nature of interactivity because they do not differentiate interactivity from related concepts. As a result, interactivity is often used loosely as another term for interaction. Some researchers (e.g. Seifert et al., 2008) do it explicitly, while some do it implicitly. For example, in his case study of the narrative app *Lessmore* (2011/2015), Schwebs (2014) writes, 'In media theory, it [interactivity] is often used to describe various sorts of interplay between a reader (or «user») and a computer program' (p.2). 'Interplay' is a term referring to an action, and is often associated with 'interaction' (Jäckel, 1995, cited in Jensen, 1998)[12]. If interactivity can be used to describe some sort of action, it must be distinguished from 'interaction'. If the two terms are interchangeable, it would be unnecessary to invent the term interactivity in the first place. Similarly, a discussion of interactivity would seem to be pointless should the term be replaced by other terms.

Seeing the problems in the usage of interactivity, Aarseth (1997), among others, declares 'interactivity' a vague idea that denotes nothing (p.48). Other scholars, however, still seek for the meaning of interactivity. A representative group of opinion considers interactivity as the quality, condition or degree of interaction (e.g. Liang, Parsons, Wu and Sedig, 2010; Nakevska et al., 2017; Rogers, 1995; Sedig and Liang, 2006). As Sedig et al. (2012) argue:

> One of the current problems in discussing interactivity is that the terms interaction and interactivity are often used loosely and interchangeably. Broadly speaking, interaction refers to reciprocal action – that is, action and reaction. The suffix "ity" is used to form nouns that denote the quality or condition of something. Therefore, interactivity refers to the quality or condition of interaction' (p.13).

This is a clearer definition of interactivity as it successfully differentiates interactivity from interaction. I agree that interactivity should be considered as a qualitative term, but I find this definition far from satisfactory as it lacks a clear explanation of interaction on which the meaning of interactivity is built. For example, it does not clarify what kind of activity qualifies as action and reaction, or how many participants are needed for such action and reaction, and under what circumstances. Similar problems are found in some other attempts in defining interactivity as well. For example, in their exploration of interactive storytelling environments,

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[11] For another example besides Smuts', Miller (2004) concludes her section of 'WHAT IS INTERACTIVITY?' by explaining what interactive is: 'As the word "interactive" indicates, it is an active experience' (p.56).

[12] The original work by Michael Jäckel (1995), 'Interaktion. Soziologische Anmerkungen zu einem Begriff' published in *Rundfunk und Fernsehen*, issue 4, is in German which I do not speak, and therefore I had to turn to Jensen's understanding of Jäckel's work.

Nakevska et al. (2017) define interactivity as follows:

> Interactivity refers to the degree to which users of a medium can influence the form or content of the mediated environment, whereas agency refers to the empowerment of the user to take meaningful actions in the world, which yield effects that relate to her intention' (p.1).

This definition of interactivity is more specific than the one offered by Sedig et al. (2012) because it provides a more detailed explanation of interaction. However, it still appears unsatisfactory. Firstly, 'meaningful actions' is a confusing phrase as what counts as meaningful is subjective. Secondly, this explanation of interaction has a clear emphasis on users – the human parts of the interaction, but there is no comment on the part or parts that the users interact with. Since interaction is consensually considered as a two-way communication (e.g. Cover, 2016; Sundar, 2007), the definition offered by Nakevska et al. (2017) appears to be out of balance.

So far, what can be inferred from the previous discussion in this chapter is that to understand interactivity, we may need sufficient understanding of *interaction*, and of *interact* and *interactive* too as they appear to be closely related. In other words, the discussion of the problematic tendency so far reveals a crucial step in understanding interactivity for this study:

[1] *To define interactivity, we need to define and distinguish it from interactive, to interact with, and interaction*.

The Divergence

Among those who use interactivity as a qualitative term in their research, there are two divergent opinions. While one group use interactivity to refer to the *quality of interaction* as mentioned before, the other group view it as a *characteristic of the media or technology* (e.g. Barry and Doherty, 2016; Downes and McMillan, 2000). Take an example from interactivity research done in education studies, when reporting their observation of children engaging with narrative apps, Aliagas and Margallo (2017) repeatedly use the phrase 'interactivity in/of storybook apps', which seems to suggest that interactivity is the property of an app. Some researchers, who oppose the idea of interactivity being a characteristic of media, argue that the way individuals make use of media is more important than media itself in determining interactivity (e.g. Kayany, Wotring and Forrest, 1996).

I tend to agree that interactivity should *not* be taken as a feature of the media or technology, but individual experience may not be an appropriate criterion to determine interactivity either. The reasons for the first part of the statement are: firstly, whether the media can be interactive is still a question. Secondly, assuming that the media can be interactive, to what extent it is interactive is to a large degree dependent on the performance of those with whom it interacts, i.e. the degree to which the media is interactive cannot be measured without being tested in a communication setting where the performance of other participants (usually human) play crucial roles in the final evaluation. If the participants fail to fully explore the interactive potential of the media, the perceived interactivity (i.e. the interactive quality of the media) will be lower than it is meant to be. In this sense, the perceived interactive quality is not equal to the intrinsic quality of the media. In the words of Sundar et al. (2015), 'perceived interactivity is a user variable [… which is] unrelated to interactivity' (p.49). Thus, if interactivity is to be regarded as the quality, property, or feature of the media, it does not seem to make much sense, and interactivity may subsequently become a hollow term.

As for individual experience, it is not considered appropriate in this study to use individual experience to determine interactivity if interactivity is to be theorised successfully. This is because the perceptions of individuals are subjective. To use the feelings of individuals to decide the nature of interactivity is to make interactivity perceptual. As a result, interactivity, as a qualitative term, is unlikely to be measured in any objective way.

So far, the discussion of the divergent opinions leads to a further understanding of interactivity for this study:

[2] *Interactivity is the quality of interaction, not the quality, property or feature of the media or technology. Subjective criteria such as user perceptions or any perceptual data should not be taken into consideration to determine interactivity*.

What is Interactivity? – Constructing a Definition

Based on the conceptions in [1] and [2], we may develop a definition of interactivity. The first step is to understand what 'interaction' means and under what circumstances 'to interact with' and 'interactive' can be used.

‘Interaction’, ‘to Interact with’ & ‘Interactive’

According to Jäckel (1995, cited in Jensen, 1998), ‘interactivity’ extends from the term ‘interaction’ (p. 188). Based on interaction research in media theory (e.g. Seifert et al., 2008), any queries about ‘interaction’ go back to the explanation of *action*, while in social sciences, *action* is ‘presupposed to depend on an active human subject intentionally acting upon an object or another subject’ (p.9). This suggests that interaction involves *intention* or *purpose*. Thus, early studies in social sciences believed that ‘interaction only takes place between humans, because objects, like machines, are incapable of intentionality’ (p.9). However, with the development of computer technology, machines are considered to be capable of active behaviours, especially with advances of the robot technology (e.g. Jarvis and Zelinsky, 2003). This is not to say that some computers, such as social robots[13], have become intentional beings, but with their simulated intentionality, they may be considered as subjects of actions, and are thus capable of interacting.

While *intentionality* appears to be a decisive criterion to determine interaction, it may not be enough to define interaction by itself. Based on the on-going studies of interaction and interactivity (e.g. Bretz and Schmidbauer, 1983; Kiousis, 2002; Rafaeli, 1988; Ryan, 2006; Smuts, 2009; Tripathi, 2011; Walsh, 2011), it can be inferred that there are three other necessities to make an interaction possible, namely *participants*, *communication channel*, and *a feedback loop*.

Frist of all, as mentioned before, interaction is consensually treated as a two-way communication. Such a communication exists in four patterns: human-to-human, human-to-human via machine, human-to-machine, and machine-to-machine (Seifert et al., 2008). This two-way communication requires a channel through which messages are exchanged between the sender and the receiver, namely the *participants* (e.g. Kiousis, 2002; Wiener, 1948). Regarding the number of participants required in an interaction, Kiousis (2002) suggests that it can be ‘one-to-one, one-to-many, and many-to-many’ (p.379), i.e. more than two participants can exist in an interaction. However, Ryan (2006), among others, considers interaction on a one-to-one base, that is, the two-way communication means two participants getting involved in the

[13] For definitions of social robots and how they work, see, for example, publications from annual IEEE International Conference on Intelligent Robots and Systems since 1989 (http://ieeexplore.ieee.org/xpl/conhome.jsp?punumber=1000393 accessed on 15th February 2017).

communication. As she puts: 'The two sides can be either two human minds, as in conversation or oral storytelling, or a human and a programmable system that simulates a communicative partner, as in digital texts[14]' (p.239).

The question of how many participants are required in an interaction is intrinsically a matter of how we understand the relationship between the message sender and the message receiver, which is closely related to another essential of interaction, namely the *feedback loop*.

A feedback loop, as the name indicates, is a loop of feedback, not feedback alone. A key discussion of feedback is found in Cybernetic theory outlined by Wiener (1948). In his *Cybernetics: Or Control and Communication in the Animal and the Machine*, Wiener explains feedback as follows:

> [A]n extremely important factor in voluntary activity is what the control engineer term feed-back. […] It is enough to say here that when we desire a motion to follow a given pattern, the difference between this pattern and the actually performed motion is used as a new input to cause the part regulated to move in such a way as to bring its motion closer to that given by the pattern. (p.13)

What Wiener discusses here seems to involve two concepts: *feedback* and *feedback loop*. When input for once is not enough to regulate the part to move in the desired way, i.e. the desired output, the actual output will suggest a second or more input(s) until the motion becomes desirable. In this situation, input for once is feedback, inputs based on the feedback from the output(s) for more than once form a loop of feedback. What can be deduced from Wiener's discussion is (and here I give my definition of feedback for this study):

Feedback *refers to the response[15] from the message receiver to the message sender on the basis of modifying the communication to bring it closer to certain mutually desired result(s) either by the participants or by an outsider or outsiders who direct(s) the actions of the participants (see the diagram I created in figure 2-1).*

In the example given by Wiener, the participants (i.e. the mechanical parts performing the

[14] 'Text' here refers to 'signs'. This is my note.
[15] Note that feedback is a kind of response, but not all responses can be called feedback.

motion) do not have intentionality, and therefore cannot desire anything. It is the human engineer, the 'outsider', who is behind and designs the pattern that controls the participants to move closer to the desired result. There are two points in need of emphasis here. Firstly, feedback indicates a mutual understanding for achieving the same goal, or to put it in another way, feedback is aimful (like *intentionality*) or given an aim. Secondly, despite the intersection between feedback and intentionality (i.e. both of them are purposeful actions in a way), feedback does not necessarily require intentionality, nor the other way around as what can be inferred from intentionality is that an intentional being or something with simulated intentionality is capable of, but not necessarily *is* offering feedback.

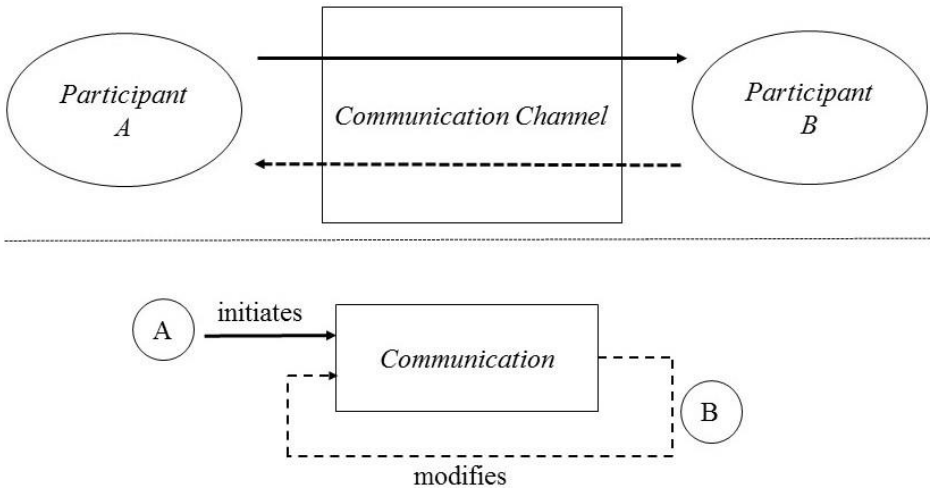

Figure 2-1: A basic visualisation of feedback. The top part of the diagram emphasises the direction of information flow in a feedback process where A is the information initiator while B gives feedback upon the information sent from A. The bottom part emphasises the modification of the communication in the feedback process where A initiates the communication and B modifies it by offering feedback.

Following my understanding of Wiener's discussion of feedback, *a feedback loop*, with the same nature as feedback, may be described with the following definition constructed by this study:

A feedback loop *contains at least two rounds of feedback where the message initiator has the opportunity to give response back to the message receiver based on the feedback sent by the latter in the first round of the message exchange as a basis of modifying the communication to bring it closer to certain mutually desired result(s) by either the participants or by an outsider or outsiders who direct(s) the actions of the participants. (see my construction of a basic*

visualisation of feedback loop in figure 2-2).

My definitions of 'feedback' and 'a feedback loop' indicate that the roles of the message sender and the receiver in a feedback/feedback loop process are *interchangeable* while with a feedback loop, the roles need to be exchanged at least twice. This perception of feedback and a feedback loop of mine echoes the opinion of Williams et al.'s (1988). In their exploration of interactivity, they point out that 'participants in a communication process have control over, and can exchange roles in, their mutual discourse' (p.10).

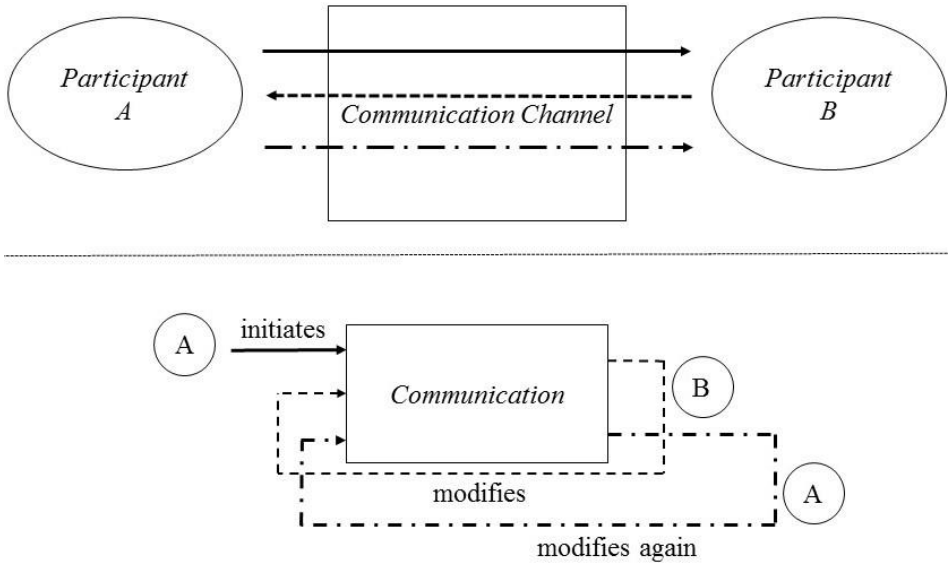

Figure 2-2: A basic visualisation of feedback loop. Same as figure 2-1. The top part of the diagram emphasises the direction of information flow in a feedback loop where A initiates the communication by sending information to B, then B gives feedback to A based on the received information, and afterwards, A gives feedback to B in regard to B's message. The bottom part of the diagram emphasises the modification of the communication in such situation where A initiates the communication, B modifies it, and A modifies it again based on B's input.

From Wiener's outline of feedback, it can also be inferred that a feedback loop involves at least two rounds of modifications of the mutual discourse because each round of feedback modifies the shared communication once (see figures 2-1 and 2-2). In computer mediated-communication, this dimension of feedback loop is specified as: the mutual discourse must be altered physically (in regard to the *form*) or modified semantically (in regard to the *content*) (e.g. Bucy, 2004; Nakevska et al., 2017; Ryan, 2006; Steuer, 1992).

In addition to the two dimensions mentioned before, Rafaeli and Sudweeks (1997) put

forward a similar idea of a feedback loop in their interactivity research, which can be seen as a third facet of a feedback loop. With a focus on the nature of the message, they propose a term named ‘a message thread’ which refers to ‘a chain of interrelated messages’ (p.1). It is further explained as ‘messages in a sequence relate to each other, and especially […] later messages recount the relatedness of earlier messages (p.3). This concept is also addressed, most widely in interactivity research, as ‘reciprocally active message exchanges’ where the message initiator has the opportunity to send a third message as a follow-up in regard to the mutual discourse (Bucy, 2004, p.375).

The third dimension of a feedback loop echoes the concept of stateless and stateful system in computer science. A stateless system does not change as a result of a message exchange, while a stateful one retain information about previous communications with a participant, modifying its behaviour based on those communications (Simon et al., 2005). To be specific, a stateless system response will only depend on the latest received message, while a stateful system response can be based on earlier messages. Only stateful system is capable of forming a feedback loop.

There is a crucial point that can be drawn from this computer scientists’ discussion about a feedback loop. A feedback loop requires not only modification of the mutual discourse, but also modification of participants’ behaviours. In other words, the participants need to change their behaviours based on the previous received message to change the mutual discourse.

Apart from the three layers of a feedback loop presented so far, there is a fourth aspect reflected from interactivity research, namely, the speed of feedback, i.e. actively reciprocal message exchanges have to be instant, happen *in real time* (e.g. Kwastek, 2008; Ryan, 2015). The speed of feedback suggests that feedback and a feedback loop require direct, undisturbed response, and any reaction done through a third party will not be considered instant and therefore not feedback. In this sense, for example, mail exchanges in regard of a mutual discourse between two people via the delivery of the postman will not be regarded as containing a feedback loop because such information is not exchanged in an immediate manner.

The four dimensions (I refer as *interchangeability*, *modifiability*, *reciprocity* and *immediacy*) are essential to a feedback loop. This conception of a feedback loop suggests that not all

communications[16] in our daily life are interactions. It also suggests that in the situation of face-to-face communication, the interaction can only be formed between two participants because any interruption from a third party will prevent the completion of a feedback loop between the two participants as the *immediacy* of message exchanges between the two will be lost. In computer-mediated situation, however, it is possible to have what Kiousis (2002) defines as 'one-to-many' and 'many-to-many' interactions provided that the messages are not exchanged verbally because verbal exchanges, such as video or audio calls, are similar to face-to-face communication. To demonstrate this point, I constructed eight diagrams presented in figures 2-3 and 2-4.

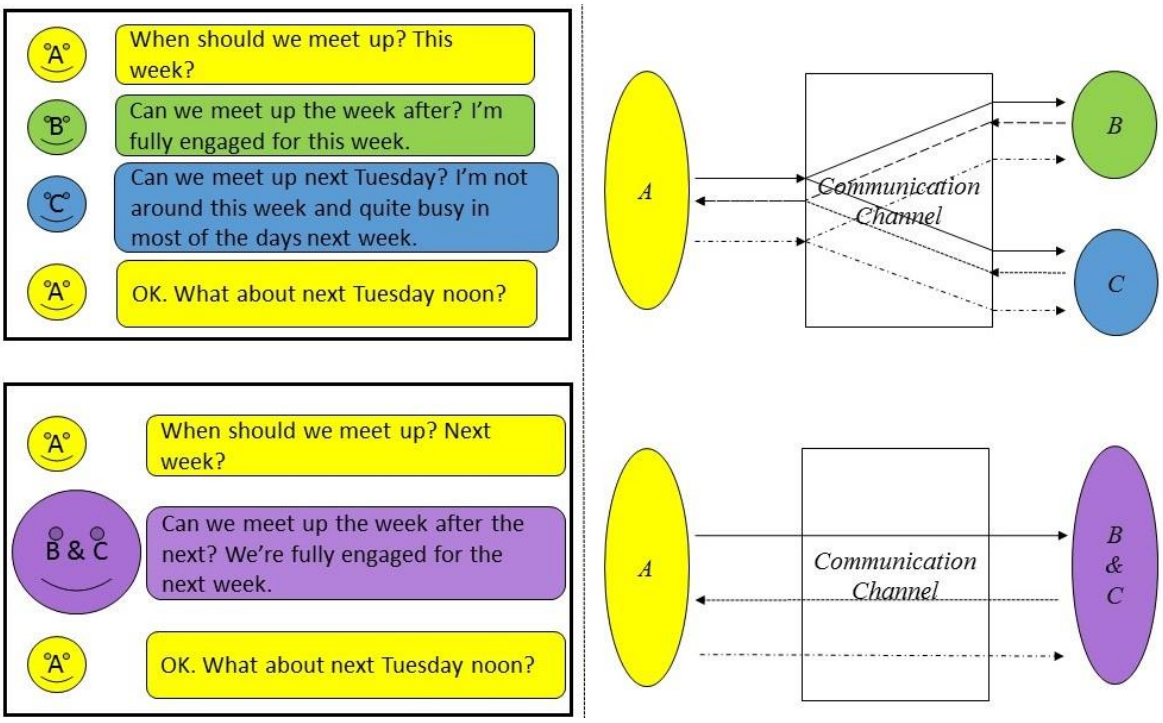

Figure 2-3: Examples of one-to-many interaction based on simulated situations in a simulated online chatting forum.

The left part of figure 2-3 shows two simulated online chatting situations, both of which can be considered as one-to-many interactions. The top left diagram simulates a situation where participant A raises a question that initiates the conversation and also establishes a goal which is to set up a time for a meet-up. Participants B and C offer their opinions on A's proposal simultaneously, and both modify A's original suggestion. Based on their inputs, A puts forward a solution to achieve the goal of the conversation while semantically speaking, the mutual

[16] For example, some communications may not be purposeful, or the communicators may not have a mutually desired goal to reach, such cases are often seen from casual daily conversations between people.

conversation has been modified for twice. The top right part of figure 2-3 translates this online communication into the format of a feedback loop. As shown on the top right, A is the message initiator whose message is received by B and C simultaneously. As the message receivers, B and C respond to the same message simultaneously and modify the discourse (by suggesting another time for the meeting). Their inputs are shown to A in real time. In this round of communication, A's role changes from the message sender to the receiver, while B and C from receivers to senders. At the same time, the message exchange consists of interrelated messages, and the communication is modified once, which successfully forms one round feedback for A. A's next message is sent to B and C simultaneously based on the previous feedback, which completes another round of feedback and establishes a feedback loop among A, B and C.

The bottom left diagram describes the situation where A is communicating with B and C at the same time. In this situation, B and C are hypothetically together on the other side of the communication channel (a computer screen for example), so that they can type something with consensus on the screen. A is hypothetically aware of how many people s/he is communicating with. It does not matter how B and C come to the conclusion in regard to A's message before typing their message. What matters is what is shown and how it is shown on the computer screen. In this communication channel, what appear are undisturbed interrelated messages sent and received between two sides in real time while one side contains two people. Thus, the translation of this communication into the format of a feedback loop shown in the bottom right diagram in figure 2-3 is different from the top right. In this diagram, the information flow is straightforward between two sides.

Both of the simulated online conversations, if done in a face-to-face manner, will not be able to construct a feedback loop among all of the three participants. This is because in a face-to-face situation, after A's initiation, B and C need to either decide who should first offer opinions on A's suggestion, or discuss with each other first about what is the best way to solve the case raised by A before giving any opinion. Whoever speaks first to A, the latter speaker's potential feedback loop with A will be cut off by the first speaker's interruption as the latter speaker's response will be less instant than the first one's. If B and C discuss with each other first, this discussion will cut off their potential loops of feedback with A as they do not offer instant feedback to A's message.

Figure 2-4 shows similar simulated online chatting situations where participants A, B, C and D form many-to-many interactions. In both cases, A and B are hypothetically together on one side of the communication channel, sending consensus messages to B and C on the other side where B and C can be together or separate. In these cases, the message initiators are two people. Following the same logic in the discussion about figure 2-3, in both situations, there is a feedback loop formed successfully among four participants as shown on the right-hand side in figure 2-4. Again, this kind of many-to-many interaction is not applicable to face-to-face communication, and the reason is the same as the one given for the discussion about figure 2-3.

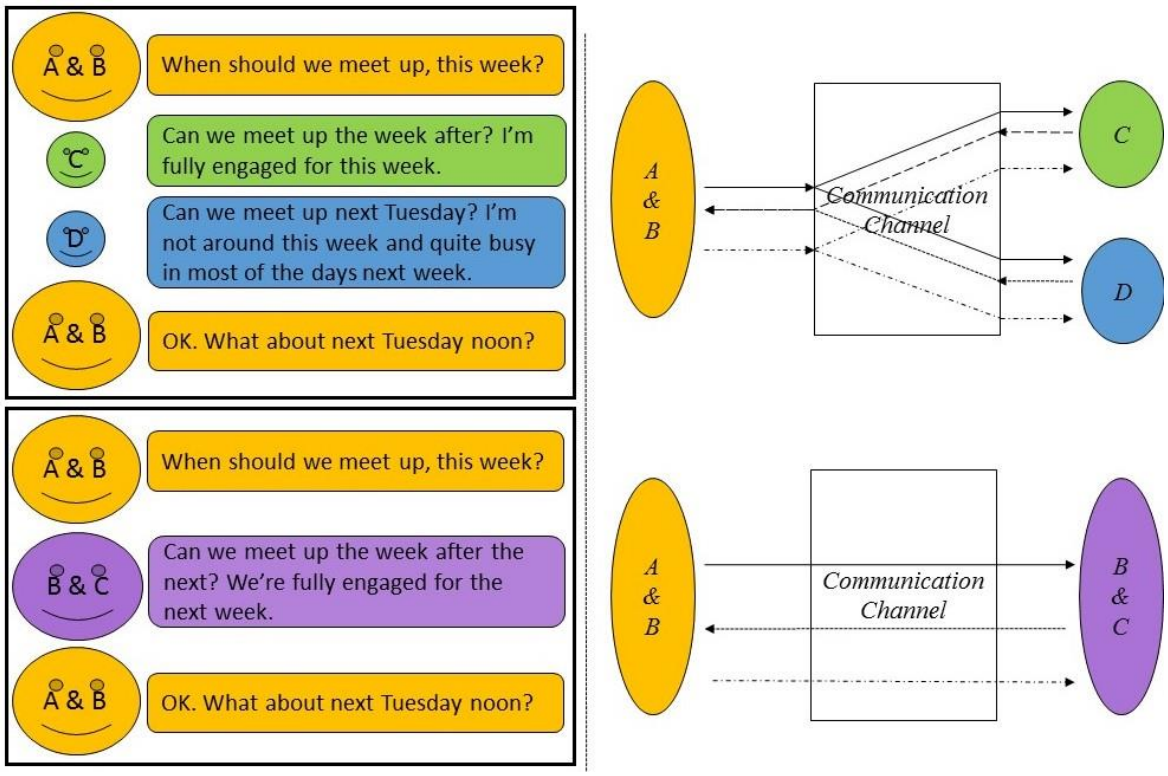

Figure 2-4: An example of many-to-many interaction based on simulated situations in a simulated online chatting forum.

By this stage of the discussion, it might be summarised that interaction is not simply reciprocal actions (action and reaction) as believed by Sedig et al. (2012). Rather, it was understood in this study as follows:

Interaction *is a two-way communication involving two or more participants with intentionality or simulated intentionality that actively exchange reciprocal messages in real time via a communication channel on the purpose of achieving certain desired result(s) out of the*

communication, and such a communication between or among the participants are modified physically in regard to the form or semantically in regard to the content for at least two rounds.

Based on this definition of interaction, 'to interact with' and 'interactive' may therefore be used in (or to indicate) the circumstances where *intentionality*, *participants*, *a communication channel* and *a feedback loop* are all present. Precisely, to say that one participant interacts with another, is to suggest that both participants are intentional beings or with simulated intentionality, both are senders and receivers in the process of message exchanges through some communication channel, and both of them have given instant feedback on the previous information sent from the other with the purpose of achieving a mutual goal. In this sense, the verb ***interact*** can be regarded to imply or address the ability or potential of the participants to construct interaction. ***Interactive***, on the other hand, can be taken to address the attribute of the communication environment or the communication channel, and it indicates that the environment or the channel has the potential to host interaction, such as a classroom[17].

With the improved understanding of 'interaction', 'to interact with' and 'interactive', the concept of interactivity can therefore be defined as follows:

Interactivity *is the extent to which at least two participants with intentionality or simulated intentionality can actively exchange reciprocal messages in real time via a communication channel with the purpose of achieving certain desired result(s) out of the communication, and such communication between or among the participants are modified physically in regard to the form or semantically in regard to the content for at least two rounds.*

This definition of interactivity suggests that interactivity can be measured scientifically. The method is to count the rounds of feedback contained in the feedback loop. The more rounds of feedback existing in the loop, the higher the interactivity is (but not necessarily resulting in better quality of the communication), and the less, the lower (but not necessarily resulting in worse quality of communication). In other words, the quality of interaction (i.e. interactivity) is not equal or directly related to the quality of communication, and the lowest interactivity reflects two rounds of feedback.

[17] An interactive classroom does not suggest that the classroom can interact with anybody or anything, but that as a communication environment, it has interactions happening within it.

Drawing a Distinction

The first step of approaching the issue of what interactivity is has been completed, where a straightforward definition of interactivity has been constructed. The next step to a clear understanding of the nature of interactivity is to differentiate it from some concepts often used confusingly in interactivity research. These concepts are *control (or choice-making, nonlinearity)*, *participatory (or responsive)*, and *procedural (or computerised)*.

When exploring artworks that invite interaction, Saltz (1997) points out that in such a work 'the artist cedes control over the sequence of events that any given spectator will encounter, allowing the piece to vary with each interaction' (p.117). This opinion is later echoed by Lopes (2001), Rafferty (2003), Ryan (2001 & 2015) and Cover (2016) who uniformly agree that an interactive artefact[18] is represented by the ability to allow its user, player, reader, etc. to control the order of information. In other words, an interactive artefact involves choices that its human participant needs to make in order to go through it. Such a feature is more often known as a feature of nonlinearity. Based on this concept of interactivity, Rafferty (2003) and Saltz (1997) seem to consider a DVD interactive as the viewer can select chapters to play.

It can be deduced that interactivity, as the quality of interaction, does reflect certain degree of control and choice-making as during the two-way information flow, the participant on each side of the information exchange has certain impact on each other, and it is during such mutual influence that the participants in the interaction modify the mutual discourse or mediate the communication environment. However, control or choice-making may not be appropriate to be the sole criterion to determine interactivity. As Smuts (2009) argues,

> Someone can read book chapters out of order just as easily as they can watch DVD chapters out of order. Hence, any account of interactivity that includes DVDs would also have to include novels, but this is clearly unacceptable. (p.55)

Smuts' argument is mainly based on intuition. Using the previously constructed definition of interactivity as a theoretical evaluation tool, it can be argued that DVDs and other similar artefacts cannot interact because among four essentials of interactivity, *intentionality*, *participants*, *a communication channel* and *a feedback loop*, there is only one present in the

[18] Here, the concept of 'artefact' is used as a communication channel through which the human participant communicates with the content of the work.

information exchange between a human and the artefacts like DVDs, that is, a communication channel. Neither a DVD disk nor its content appear to have simulated intentionality that can play the role of a participant to form a two-way information flow with the human viewer. A DVD simply responds to human commands, but it does not, neither does the DVD content, offer follow-up information to the human viewer with certain purpose that can form a feedback loop. Therefore, based on the definition of interactivity constructed for this study, DVDs and other similar artefacts do not seem to be able to interact with other intentional beings, not to mention reflecting any quality of interaction.

Apart from taking control or choice-making as a decisive characteristic of interactivity, interactivity research also shows another problematic assumption. As the majority of interactivity studies nowadays concern computer-mediated communication, the term 'interactive' seems to have become another word for computerised (Aarseth, 1997, p.103). It seems that as long as something is digital, it is likely to be assumed interactive. Some researchers even define 'interactive' by directly defining the features of computers. For example, in her influential work *Hamlet on the Holodeck,* Murray (1998) argues that *procedural* and *participatory* are 'two properties [that] make up most of what we mean by the vaguely used word *interactive*' (p.71). By 'procedural property', she uses it to refer to 'the procedural power of the computer' (p.71), and by 'participatory property', she seems to use it to address the 'responsive behavio[u]rs' of computers (p.74).

There are two points that need to be raised here. The first point is that, as previously argued, interaction is a concept not exclusive to the digital age, so is not interactivity. As Smuts (2009) reminds us:

> Just because much interactive art is software based, this does not mean that interactivity is procedural in a meaning sense. […] Again, we should not confuse an implementation of interactivity with its essence. (p.62)

The second point is that *responsive* should not be mistaken with *interactive*, and *to respond* is not equal to *to interact*. To differentiate the two concepts, it may be better to go back to the definition of feedback I previously provided:

Feedback refers to the response from the message receiver to the message sender on the basis of modifying the communication to bring it closer to certain mutually desired result(s) either by the participants or by an outsider or outsiders who direct(s) the actions of the participants.

This definition suggests that feedback requires certain response, but not all responses are feedback because a response does not necessarily require a purpose, nor does it necessarily need to modify the communication. For example, in the following situation, B may be considered as merely responding to A but not interacting with A:

A (upon seeing B): *John!*
B (John, upon hearing A's word): *Yes?*

To link this understanding of responsive and interactive to the previous discussion, it was introduced that computer scientists have drawn distinction between stateful and stateless system regarding their ways of forming a feedback loop. The distinction can also be interpreted as stateless system is responsive, but is incapable of making interaction because they cannot modify themselves based on the message exchange.

In addition, in the same way as *to give feedback, to respond* only indicates *one-way* information flow, while *to interact* requires a two-way information exchange. This point may be demonstrated by figures 2-1 and 2-2. As introduced previously, figure 2-1 is a visualisation of feedback, in which the arrow pointing from A to B refers to the information A sent to B, and the arrow pointing back to A is used to refer to the feedback given by B. In other words, the information flowing from B to A represents B's *response* as well as B's *modification* of the communication, so *to respond*, or *responsive* only indicates one-way information flow. Figure 2-2, in contrast, shows a feedback loop which is a crucial element to construct interaction. To form a feedback loop, it requires two-way information flow (sending and receiving) while each direction of the information flow must be related to the previous immediate flow from the other direction, and at the same time, both directions of information flow must modify the communication. Thus, being responsive can be regarded as a necessary condition of being interactive, but it is not sufficient.

Can Narrative Apps Interact?

It was introduced previously that being interactive seemed to be regarded as a defining feature of the narrative app by several academic studies on the narrative app. Based on the understanding of interactivity developed in this chapter, we may be able to evaluate the so-called interactive features of the narrative app.

Generally speaking, when we open the narrative app on a touchscreen device, we have already established one essential of interaction: the *communication channel*, which can be understood as the touchscreen in a narrow sense, or the touchscreen technology in a broad sense. If the interaction can be established, the human human participant on the one side of the touchscreen can be considered as *a participant*, and the application software on the other side is *the other participant*; the *mutual discourse* or the communication can be regarded as being visualised as the immediate app content on the touchscreen; the *mutual desired result* can be considered as, for example, composing a story. This means, what is crucial to determine interaction in the communication between the human participant and the app are *intentionality* and *a feedback loop* that must both present.

As discussed previously, *intentionality* and *a feedback loop* are closely related, but do not recognise each other, which means that even if a feedback loop is identified in the communication between the human participant and the narrative app, it is not sufficient to conclude that the apps can interact. The presence of intentionality still needs to be located. Human beings are intentional beings, but the narrative app is an object. Therefore, it is necessary to prove that the narrative app behaves 'intentionally' in the communication. Based on the previous understanding of intentionality, to judge whether an app reflects any simulated intention is to decide whether the app 'acts' with a purpose[19] meanwhile giving instant feedback on the human participant's input.

Narrative apps can offer a make-believe communication, which is achieved through

[19] As we know, books (novels, picturebooks, etc.), when used to tell stories, may contain certain purposes from the authors, but the books cannot be said to have intention or simulated intention because the content in books cannot react to the readers' input immediately. In fact, it cannot perform any action at all. As Ryan (2006) points out, 'a print text does not perform any action, nor does it modify itself' (p.239). This may be a major difference between print texts and some digital texts.

touchscreen technology. Certain areas on the touchscreen (i.e. hotspots) are programmed to respond to the electricity in the human body when the human touches the areas (Nugent, 2016). The touch thus triggers the hotspots that alter the presentation of the app content to various degrees. From this perspective, to decide whether an app can interact is to identify two conditions in the message exchanges (if there is any) between the human participant and the app: [1] purposeful actions, and [2] the presence of *interchangeability*, *modifiability*, *reciprocity*, and *immediacy*, four conditions of a feedback loop. There are three generations of narrative apps identified in Chapter One. Concerning their distinctive features from one another, I will inspect the matter of interactivity generation by generation.

Basic Patterns

As introduced in Chapter One, most of the First-Generation apps contain very basic hotspots, mostly reflected in tapping to change a scene, or tapping to generate new pieces of content such as reading aloud the written words, characters performing actions, and new text popping out. I will begin my interactivity detection with the feature of scene-shifting in the First-Generation. When human participants want to change a scene, they send the command of 'change the scene' to the app by performing an action on the touchscreen, usually by locating and then tapping the navigation button or swiping the screen with fingers. When the action is received and accepted by the software, it will acknowledge the human participant by modifying the content accordingly (see figure 2-5).

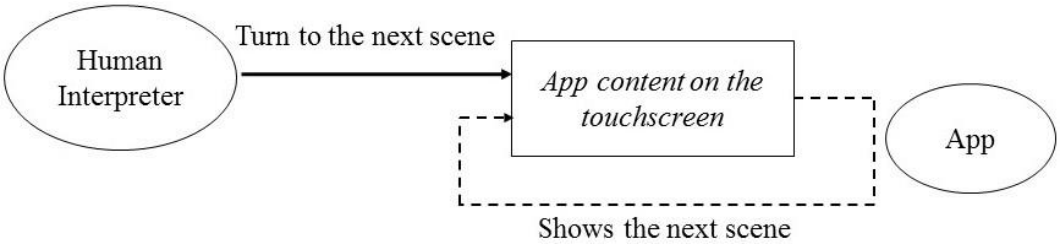

Figure 2-5 Visualisation of the process of scene-changing in the 1st Generation apps.

What presented in figure 2-5 is seemingly similar to the visualisation of feedback shown in figure 2-1. However, there is a significant difference between the two diagrams. In figure 2-5, what the app does is responding to the human participant's input, but not offering any feedback based on the input because the modification of the content (i.e. the scene-changing) is a result of the app receiving and accomplishing the human command, not a result of a purposeful action

from the app. To be more precise, the scene being changed can be regarded as the modification of the communication done by the human participant, not the app. It is necessary to point out that this argument may still apply to the situation where human participants cannot predict what may happen in the scene before they perform the actions. This is because their actions are purposeful despite everything. The purpose is to know what may happen if they do something to the app. Thus, when the app responds to their actions, it is still they who have modified the narrative content in the app.

In both cases, there is only one round of modification in this mutual discourse, which does not fulfil the condition of a feedback loop where there must be at least two rounds of modification of the mutual discourse. This suggests that in the situation where the human participant performs command-type of actions on the touchscreen while the app receives and executes these commands, there is no intentional behaviours detected from the app side, and there is no feedback loop formed, so this type of communication between the human participant and the narrative app is not considered as an interaction in this thesis. To put it in another way, the feature of inviting human participants to perform actions to change the presentation of the narrative app content (e.g. visual, verbal, and auditory) may not be considered as an interactive feature of the narrative app.

To take a step back and assume that one can successfully establish the argument that in the previously described situations where what the app does can count as giving feedback, there is still no follow-up action from the human participant to complete a feedback loop in regard to the mutual discourse (i.e. to change the scene). This is because once the scene has been changed, the mutual discourse ceases immediately as the goal of the human participant has been achieved. To put it in the words of Wiener's feedback theory, the desired 'pattern' has been met by regulating the motion, in this case, only once. Thus, it does not seem to be achievable to establish a loop of feedback between the human participant and the app in the situation where the narrative content has changed due to the actions performed by the human participant on the touchscreen.

In fact, the participatory patterns commonly seen from the First-Generation apps seem to be exclusively the commanding-executing type, such as touch 'read to me' button to listen to the story, and touch an object to see it move or make sounds. In this commanding-executing type of participation, besides no established feedback loop, the roles of the message sender (the

human participant) and the receiver (the app) are *not interchangeable* as it is always the former who sends commands and the latter receives and implements them. Therefore, the First-Generation of the narrative app do not seem to allow any interaction. They are responsive, but not interactive.

As for the apps similar to *Heart and Bottle* (2010/2010) that sit between the First and the Second-Generations, their cases seem to be more complicated. These apps invite more human participation than the First-Generation of the narrative app in terms of the participatory pattern. Therefore, it is necessary to identify and discuss patterns that do not exist in the First-Generation. Apart from the responsive participatory patterns identified in the First-Generation, apps like *Heart and Bottle* (2010/2010) allow the human participant to perform a series of succeeding actions. Such actions require examination.

Take *Heart and Bottle* (2010/2010) for example, there was a scene from the app briefly described in Chapter One (see figure 2-6). In this scene, based on the verbal and visual signs, there appears to be a mutual discourse to be established between the scene and the human participant, that is, the human participant needs to aid the app to help the girl put her heart in a safe place. The implied human participant needs to perform three succeeding (logical) actions in this scene: to take off the x-ray board from the hanger, to put it in front of the girl's chest to show her heart, and to tap the heart to let it jump into the empty bottle.

If we consider the visual and verbal signs as the beginning message sent to human participants from the app, we may consider the series of actions to be performed by the human participants as their feedback to the message. Generally speaking, this kind of feedback is another form of commanding-executing where the signs as a whole are the commander while the human is the executor. This case is more straightforwardly presented in the HS of the same app (see figure 2-7). On the right-hand side of the screenshot shown in figure 2-7, it reads 'Click HERE to begin'. This is a command sent from the app to the human participant. As the message receiver, if the human participant taps the hotspot, s/he will be brought to the next scene where the story begins. In this case, in the mutual discourse of clicking to start the story, the roles of the message sender and the receiver are not interchangeable, and therefore this commanding-executing type of participatory pattern does not allow interaction either.

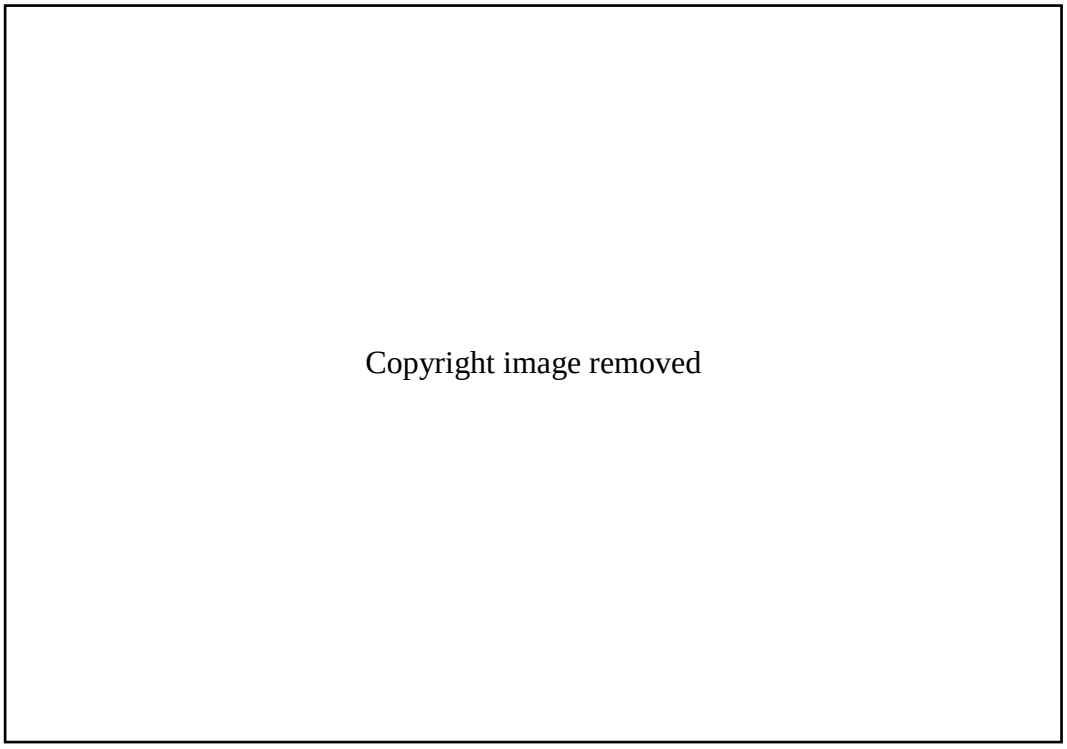

Figure 2-6: A screenshot of an NS in *Heart and Bottle* (2010/2010).

However, there is a difference between the cases shown in figures 2-6 and 2-7. In figure 2-6, the execution will be accomplished by more than one action from the human participant. In between each action, the roles of the commander and the executor will change, but all the modifications of the mutual discourse, as have argued previously, are still done by the human participant. To be precise, in the situation where the implied human participant takes off the x-ray board based on the visual and verbal hints from the scene shown in figure 2-6, the commander is the app and the executor is the human participant. When the implied human participant puts the x-ray board on the chest of the girl and a heart appears immediately, s/he becomes the commander and the app becomes the executor who implements her/his 'plan'. When the implied human participant taps on the heart and it jumps into the empty bottle, her/his action is based on the visual and verbal hints in the text where the heart is bouncing and the verbal signs reads 'she put it [i.e. the heart] in a bottle and hung it around her neck'. In this situation, the textual hints can be considered to instruct the human participant to perform her/his action. However, despite the fact that the roles of message sender and the receiver are interchangeable in this scene, the actions are all supposed to be taken by the human participant. The app does not offer any feedback that modifies the previous modification done by the human

participant. Therefore, the participatory patterns present in *Heart and Bottle* (2010/2010) and other similar apps cannot be considered as interactive features.

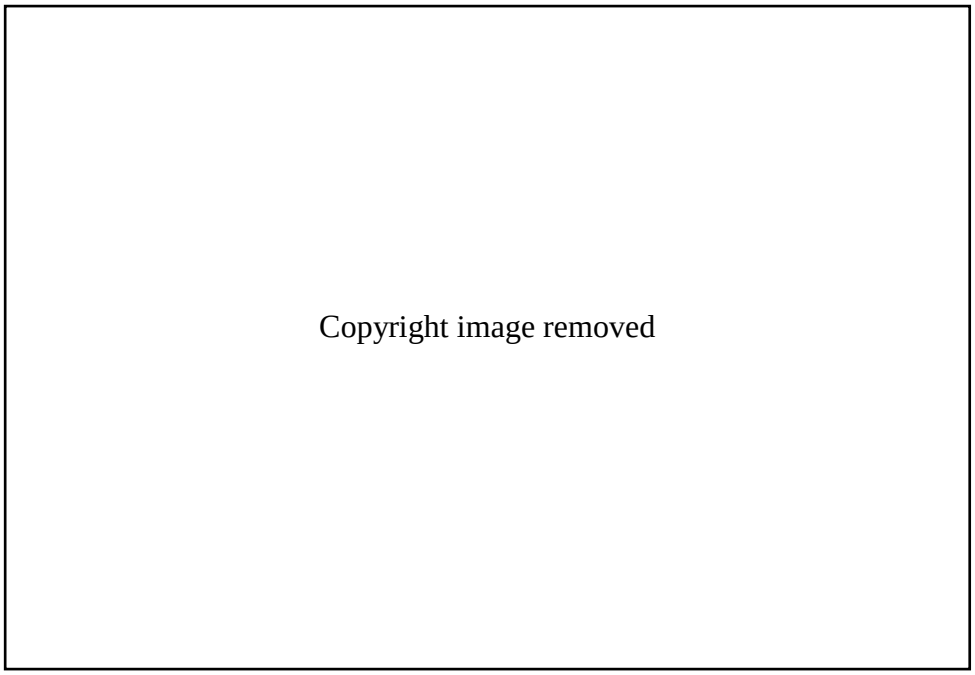

Figure 2-7: A screenshot of the HS of *Heart and Bottle* (2010/2010).

In the Second and Third-Generation of the narrative app, despite the fact that the participatory features appear to be richer in format, in nature, they are mostly similar to the patterns discussed previously, i.e. they mostly belong to the commanding-executing type where only the human participant's actions change the presentation of the content of the narrative app. However, there are some cases that may require further analysis.

Particular Cases

The first representative case is from narrative apps that are similar to those developed by Nosy Crow. Most of the apps designed by Nosy Crow so far 'speak' to their human participants directly, which seems to make the apps what Ryan (2006) calls 'communicative partner(s)' (p.239). However, a closer examination may reveal that these apps only 'speak' like human beings, but they still do not give feedback, invite feedback, or complete a feedback loop.

Figure 2-8: A screenshot of the HS of *Jack and the Beanstalk* (2014/2017).

For example, in *Jack and the Beanstalk* (2014/2017) the character Jack directly addresses human participants to give them instructions on how to make most out of the app (see figure 2-8). Sometimes he asks human participants for help (see figure 2-9). In some other scenes, other characters speak to Jack asking him to solve puzzles or complete some tasks while the human participants have to act on behalf of Jack. In all these occasions, human participants play roles of message receivers, and follow instructions or requests sent from (the characters in) the app. Although they may feel like 'communicating' with real human beings when being directly addressed by the app, the fact is that there are no exchanges of messages in all the occasions, all the modifications are supposed to be done by the human participants, and therefore there is no feedback loop established. Similar situations like what discussed with Nosy Crow's apps can also be found in some Third-Generation apps such as *Wuwu & Co.* (2014/2017) where the human participant is spoken to and requested to aid the characters in the app.

Figure 2-9: A screenshot of an NS from *Jack and the Beanstalk* (2014/2017). In this scene, the human participant is asked to aid Jack to feed the cow, clean her and put her bell on.

The second case that requires attention is from apps that are similar to Brain Main's *Lil' Red* (2012/2013). Although the app is wordless, the 'communication' between the app and the human participant may still feel real. This is because instead of using words, the app takes advantage of body language to convey information (see figure 1-13 on p.47 in Chapter One). This strategy of storytelling is likely to make the human participant more attentive to the story development and perform purposeful actions after linking all the information together, for example, s/he needs to figure out what the hand 'wants' the girl on the swing to do based on the gestures made by the hand (see figure 1-13).

In the scene shown in figure 1-13, intentionality is arguably perceivable from the gestures of the hand because the actions it performs – signalling at the girl – are purposeful. However, it is debateable whether a feedback loop can be established between the hand and the human participant. I argue that it may not be established.

The first reason is that the hand and the human participant do not have a *mutually desired result* to meet and thus whatever modification they make for the scene may not qualify as

feedback. To be specific, as a first-time encounter with the hand, the human participant is unlikely to know what it wants from the girl by those signalling gestures, and thus it is more likely that the purpose of the human participant at the time is to find out what the hand wants. The hand, however, 'knows' what it wants. Therefore, the roles of the hand and the human participant in this scene are puzzle maker and puzzle solver who do not share a mutual goal.

The second reason is that the roles of the message sender and the receiver in this scene are not interchangeable. The hand can be regarded as the message initiator when it signals at the girl. Receiving this information, the implied human participant will send the girl to the hand but by doing so, the human participant does not send any feedback to the hand. When the girl is close to the hand, it sends another message contained in the speech bubble shown on screenshot on the right in figure 1-13. Receiving this message, the implied human participant may tap the girl to make her accept the task. Again, there is no feedback given from the human participant to the hand in this round of information flow. What is reflected here is merely the human participant's acknowledgement of receiving the instruction from the hand. Therefore, in both rounds of information flow, the hand is the message sender and the human participant, the receiver. Their roles are not exchanged.

The third reason is that there seems to be a lack of *immediacy* in the responses from the human participant. Presumably, whatever message sent from the hand to the girl is meant to get the human participant involved, to let her/him receive and decipher. If the 'mutual discourse' is considered as the one between the hand and the human participant, s/he cannot respond to the hand immediately without commanding the girl, a third party or a messenger, to do something first. If the 'mutual discourse' is considered as the one between the hand and the girl, the girl cannot respond to the hand immediately without being commanded first by the human participant, the third party or the messenger. Thus, in both situations, the condition of immediacy cannot be met. Therefore, this scene and the rest of the scenes which are designed with the same strategy in *Lil' Red* (2012/2013) do not invite interaction, but it does involve participation.

The third case to discuss is the app *The Monster at the End of this Book* (2011/2014) published by Sesame Street. Similar to Nosy Crow's apps, in this app, there is a monster speaking directly to the human participant. It keeps telling, begging and threatening the human participant not to turn the page of the book. Sometimes it creates some barriers to prevent the

page from being turned. These actions of the monster can be considered ‘intentional’, and the communicative environment created by this app is seemingly interactive. However, I argue that this app cannot interact either. The main reason is the same as that provided for *Lil’ Red* (2012/2013) – the monster and the human participant do not share *a mutual aim* that they both try to modify the communication to achieve.

Apparently, the purpose of the monster is to prevent the human participant from getting to the end of the book, while what the implied human participant will try to do is to turn the pages to the end. Therefore, although intentionality is present, the feedback loop between the monster (the app) and the human participant cannot be established due to the lack of a mutually desired result. It is arguable that the true purpose of the design is to urge the human participant to go to the end of the book. In this sense, the designer and the human participant do share a mutual goal. However, in this case, assuming that there can be a communication established between the designer and the human participant, such a communication is done via a third party, the app (precisely the monster in the app). Therefore, such a communication lacks immediacy in the message exchanges, and may not be considered as an interaction.

So far, viewed from the narrative apps accessed in this research, they all seem to present similar participatory patterns discussed in this chapter. This may suggest that these narrative apps do not have so-called interactive features. However, it is not known whether some other narrative apps on the market or yet to come may or may not possess interactive features.

Conclusions and Implications

This chapter has been used to investigate interactivity, a so-called ‘defining feature’ of the narrative app in the context of computer-mediated communication. It has pointed out that previous studies on interactivity did not construct satisfying definition of the term, which may affect the validity of the studies on the effects and values of assumed interactive artworks.

About Interactivity

To move towards filling this theoretical hole concerning interactivity in children’s literature, I have constructed a clear definition of interactivity, and have drawn clear distinctions between interactivity and its closely related concepts. This study has suggested that interactivity is the

quality or degree of interaction, not a property of a medium. To realise interaction (i.e. the base of interactivity), four essentials are required, namely *intentionality*, *participants*, *a communication channel*, and *a feedback loop*.

The discussion of the four essentials has suggested that the concepts of 'interaction', 'interactivity', 'to interact with' and 'interactive' are not exclusive to computer-mediated communication, while a computer-mediated communication environment is not necessarily interactive. However, there seems to be a distinction between interactions achieved in computer-mediated communication environments and non-computer-mediated ones. This distinction may be found in the number of participants. In non-computer-mediated communication environments, an interaction seems to be only achievable between two and only two intentional participants, but computer-mediated communication environments can support one-to-many and many-to-many types of interactions. What appears to cause this distinction is the nature of a feedback loop that consists of four necessities, namely, *interchangeability*, *modifiability*, *reciprocity* and *immediacy*.

The investigation of the feedback loop has shown that interactivity, as a qualitative concept, can be measured objectively instead of relying on perceptual data. Such a method can be simple and straightforward: as the level of interactivity is dependent on the rounds of feedback contained in the feedback loop, the more rounds of feedback there are, the higher the quality of the interaction may be. However, this study has also suggested that the quality of interaction does not seem to be related to the quality of communication. In other words, interactivity, although quite a buzz word nowadays, may not have any indication on the quality of an artefact.

Interactivity & the Narrative App

Based on the discussion of interactivity, this study has examined the nature of their participatory features in three generations of the narrative app identified in the previous chapter. The study has shown that so far, the narrative apps accessed by this study have displayed uniformly one distinctive participatory feature, namely, *commanding-executing feature*. This feature may appear in various specific forms in different narrative apps.

In terms of participatory roles, this study has identified three forms of the commanding-executing feature:

[1] Human commander – app executor type (roles nonexchangeable);

[2] App commander – human executor type (roles nonexchangeable);

[3] Human commander/executor – app executor/commander (roles exchangeable)

In terms of participatory actions, this study has identified two forms of the commanding-executing feature:

[1] Single round of command and execution in a mutual discourse;

[2] Multiple interrelated rounds of commands and executions in a mutual discourse.

In terms of participatory immediacy, this study has identified two forms of commanding-executing feature:

[1] Immediate command(s) and execution(s), where the command(s) and the execution(s) do not need to go through a third party, a messenger;

[2] Delayed command(s) and execution(s), where the command(s) and the execution(s) need to go through a third party, a messenger.

In whichever specific form, this commanding-executing participatory feature of the narrative app has been evaluated as responsive but not interactive because in these situations a feedback loop cannot be established successfully between the app and the human participant. However, this is not to suggest that the rest of the narrative app on the market or those in the future will not interact.

It can be inferred from this study that as a piece of software, the narrative app is capable of possessing artificial intentionality. This means that to make a narrative app interact with the human participant, all that is left to do is to enable the app to establish a feedback loop with the human participant. In other words, an interactive narrative app allows an active collaboration between itself and the human participant in constructing the narrative. These construction processes must involve at least two modifications from active and instant interrelated message exchanges between the app and the human participant, both of whom can offer ‘opinions’, ‘suggestions’, ‘discussions’, etc. to the communication for a mutual purpose.

Moreover, it can be deduced from this study that, although the narrative apps examined by this study may not have shown distinctive interactive features, theoretically, an interactive narrative app may have the potential to challenge the traditional concept of authorship, audience and text. This is because in an interactive narrative environment, the text is supposed to be constructed by both the audience and the author. In fact, in an interactive narrative environment, the roles of the audience and the author are supposed to be interchangeable, which means the degree of control that the audience can have on the narrative development should be as much as that of the author's. However, this is by no means to suggest that interactivity should be used as a criteria to evaluate the quality of narrative texts, as Bucy (2004) remarks, 'when it comes to interactivity, more is not necessarily better' (p.377). This suggests that for a story, *what is told may be as important as how it is told*.

This conception of interactivity and the narrative app had raised a question for this study:

- Has touchscreen technology changed anything essential in storytelling?

The question suggests that for this study to develop an understanding of how the narrative app tells stories, it is necessary to explore how storytelling works in a general sense, and, in succession, to investigate whether the narrative app has brought anything profoundly different to the basic principles of storytelling. This series of inquiries will be conducted in the following chapter.

Chapter Three: The Storytelling Mechanism I: The Mechanical Layer[20]

> *The danger [… is] that our research for what is different about a medium distracts us from how much that medium shares features with others.*
>
> (Punday, 2011, p.19-20)

Introduction

In Chapter Two, I developed a theoretical understanding of the concept of interactivity. Based on this understanding, this study suggested that the participatory features in the narrative apps accessed by this research do not seem to be interactive. This conception led to a question that appears to be crucial to understanding how the narrative app tells stories. This question is:

- Has touchscreen technology changed anything essential in storytelling?

Guided by this question, this chapter aims to explore the basic principles of storytelling to keep building the theoretical base for analysing the narrative strategies of the narrative app. This aim suggests that the scope of this exploration must be broad enough to cover ideally all kinds of storytelling, which means it must examine as many forms of literature as possible, and must examine as many literary media as possible. Under this scope, there are two specific questions to be explored in this chapter:

1. What are the basic elements of storytelling?

2. Has the narrative app brought any element essentially distinctive from the basic elements of storytelling?

[20] Part of this chapter is or will be published in *Libri & Liberi* under the title 'Anything New Here in Story Apps? A Reflection on the Storytelling Mechanism across Media'(Zheng, 2016), and 'Storytelling Mechanism 2.0: Another Perspective on Digital Literature' (Zheng, 2018).

The Storytelling Mechanism

Regarding how a story is told, Eileen Colwell (1980), a 'gifted storyteller and creative pioneer of children's libraries' (Stephenson, 2002), points out, 'Storytelling is made up of three essential elements, the story, the storyteller and the audience' (Colwell, 1980, p.2).

Colwell's discussion is under the context of oral storytelling. A broader sense of storytelling according to scholarship in narratology and media studies may refer to both conversational (oral) and non-conversational storytelling (e.g. Bal, 2009; Chatman, 1975; Fludernik, 2009; Rayner et al., 2001; Ryan, 2004). Despite the context, Colwell's three essentials of storytelling seem to apply to both conversational and non-conversational situations, i.e. to make both conversational and non-conversational storytelling possible, there seem to be three necessities required: [1] the story that is intended to be told, [2] the medium to present the story, and [3] the people to receive the story. These three necessities are referred to by Espen Aarseth (1997), a key figure in game studies, as 'the verbal sign', 'the medium' and 'the human operator' – three ends of a textual machine. Aarseth (1997) argues:

> [T]he text is seen as a machine – not metaphorically but as a mechanical device for the production and consumption of verbal signs. [… A] text must consist of a material medium as well as a collection of words. The machine, of course, is not complete without a third party, the (human) operator, and it is within this triad that the text takes place. […] The boundaries between each part can be defined only in terms of the other two. Furthermore, the functional possibilities of each element combine with those of the two others to produce a large number of actual text types. (p.21)

The term 'text' as used by Aarseth is different from its use by linguistics and semioticians. For Aarseth, 'the word [is used] for a whole range of phenomena, from short poems to complex computer programs and databases' (p.20-21). On the one hand, what Aarseth describes here can be considered as an even broader sense of storytelling, as it includes computer programs and databases. On the other hand, it can be regarded as a narrow sense of storytelling since it only considers verbal signs, while visual signs, for example, as elaborated in picturebook theory (e.g. Nikolajeva and Scott, 2006; Nodelman, 1988; Sipe, 1998), can also tell stories.

In spite of this, Aarseth's insight of a textual machine together with Colwell's understanding of oral storytelling seem to suggest that storytelling can be viewed as a mechanism, not metaphorically, but literally, where the three elements, the signs/story, the medium/storyteller,

and the human operator/audience mutually influence each other to generate eventually a version of narrative.

The term 'text' used throughout this thesis is similar to Aarseth's conception of text, i.e. 'a mechanical device', but is used in a broader sense than his as it is intended to include all kinds of signs (e.g. verbal, visual, auditory, and tactile) that can form a narrative or be used to construct a narrative.

For the sake of argument, this study proposes three terms to refer to the three essential components for storytelling despite it is conversational or non-conversational, digital or non-digital. The three terms are:

- the narrative content
- the medium
- the interpreter

The *narrative content* refers to the story intended to be told, i.e. the abstract concepts to be materialised into signs that include, but are not limited to, visual, verbal, auditory and tactile signs. From the semiotics' point of view, the concept of narrative content refers to the *signified*, while the materialised signs are *signifiers* (see Saussure, 1983)

The *medium* refers to the physical agency via which the narrative content is *directly* presented. The medium can be stable or unstable. Briefly, a stable medium is something or someone that is consistent considering its/her/his/their performance(s), such as a piece of paper or a (touch)screen; an unstable medium is something or someone that is not consistent in terms of its/her/his/their performance(s), such as, at this stage of societal and technology development[21], a human being (storyteller, singer, actor, actress, etc.).

The *interpreter*, as the third component of storytelling, refers to the person who receives, interprets and/or reacts to the narrative content. The reason for using the term interpreter in this

[21] As the development of technology is unpredictable, and as human potential seems to be infinite, it is better to keep an open mind for the understanding of stable and unstable media. Therefore, hypothetically I consider an object and a human being as both being capable of performing consistently or inconsistently.

thesis instead of other terms is that for people who engage with the narrative app, they are both players and readers, as well as audience and users. However, whatever the roles, the people may need to have meaning-making skills (of various degrees) to proceed with what they start with, i.e. they need to interpret to get the story (going). Therefore, 'interpreter' seems to be a more general term that can address a person in any narrative context, such as a play, a film, a video game, a narrative app, and a book.

The narrative content plays a decisive role in the choice of the medium, while the chosen medium directly influences the presentation and the reception of the narrative content. This perception of the relationship between the narrative content and the medium also echoes the views in narratology and media studies (e.g. Ryan, 2014). Meanwhile, meaning is made by the interpreter by working with an integrated body of the medium and the narrative content. I generated the relationship among the three elements of storytelling into a comprehensible mechanism shown in figure 3-1 as the ***storytelling mechanism***.

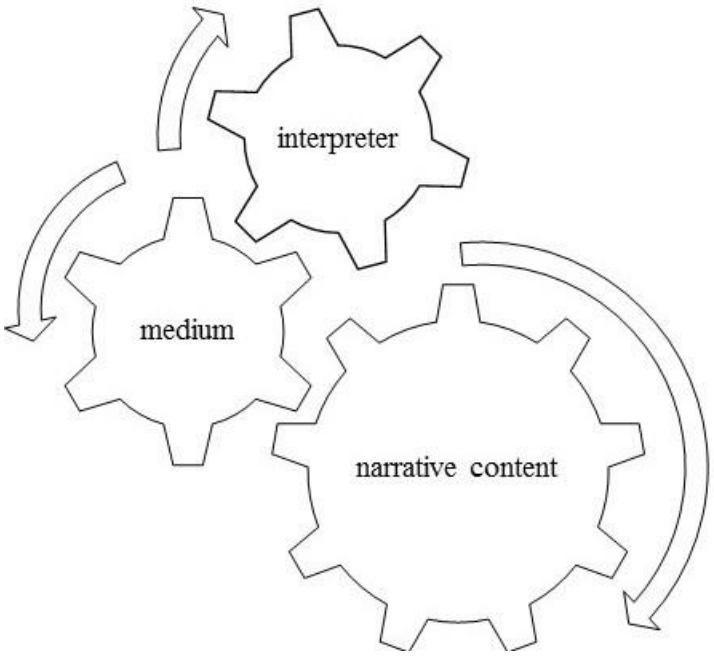

Figure 3-1: A visualised storytelling mechanism.

In this representation of the mechanism, the gear of the interpreter does not touch the gear of the narrative content. This is because the interpreter and the narrative content cannot influence each other without contacting the gear of the medium. This storytelling mechanism is considered to have two layers, the *mechanical layer* where the arrangement and the formation of signs

occurs, and the *interpretative layer* which involves meaning-making.

With the appearance of narrative apps, what seems to have changed in the storytelling mechanism is how signs are generated, formed and placed, i.e. the relationship between the medium and the interpreter seems to have changed. As suggested by previous studies on narrative apps, such a relationship seems to involve more participation between the interpreter, the medium and the narrative content than those on other platforms of storytelling (e.g. Al-Yaqout and Nikolajeva, 2015; Schwebs, 2014; Stichnothe, 2014; Turrión, 2015; Yokota, 2015). What brought about the change is the change of the medium, i.e. the touchscreen. Therefore, it is necessary to start the investigation of how narrative apps tell stories by enquiring about the role of the medium in the storytelling mechanism.

In the discourse of storytelling, scholarship so far has investigated all the three elements in the storytelling mechanism, but with different degrees of attention. In children's literature where both digital and non-digital literature are concerned, much has been done on

- the *narrative content* with approaches from narrative theory (e.g. Nodelman, 1988; Stichnothe, 2014), literary theories (e.g. Hunt, 1991; Turrión, 2014), postmodernism (e.g. Sipe and Pantaleo, 2008), rhetoric (e.g. Nikolajeva, 2002), semiotics (e.g. Nikolajeva and Scott, 2006; Sipe, 1998), aesthetics (e.g. Nikolajeva, 2005 & 2015; Schwebs, 2014; Sipe, 2001), genre studies (e.g. Nodelman, 2008), historical studies (e.g. Reynolds, 2016), etc.;

- on the *interpreter* from reader response theory (e.g. Arizpe and Smith, 2016; Arizpe and Styles, 2016) educational perspectives (e.g. Bus, Takacs and Kegel, 2015; Manresa and Real, 2015; Meek, 1988; Sipe, 2008; Wooten and McCuiston, 2015), cognitive approaches (Nikolajeva, 2014), childhood studies (e.g. Grenby, 2011), etc.

However, not many studies have focused on the role of the *medium* in storytelling. For those that have, such as studies on picturebooks and narrative apps, most of their focus is on the *interpretative level* of the influence of the medium on the storytelling mechanism, i.e. due to the design/materiality of the medium, paper as the medium of the picturebook and the touchscreen as the medium of the narrative app can influence the interpreter's perception and interpretation

of the narrative content (e.g. Al-Yaqout and Nikolajeva, 2015; Beckett, 2012; Doonan, 1986; Nikolajeva and Scott, 2001 & 2006; Nodelman, 1988; Sipe, 2001; Sipe and McGuire, 2006). However, the *mechanical level* of the influence of the medium on the storytelling mechanism has been neglected for a long time.

Mechanical Textual Behaviour (MTB)

At a mechanical level, the nature of the medium influences the arrangement of signs, meaning the features of the medium decide the degree of the mobility of signs, or in other words, the characteristics of the medium determine the extent to which the signs in it can move or be moved around and rearrange themselves or be rearranged. Such an arrangement of signs is termed by this research as *mechanical textual behaviour* (MTB). Specifically, I define MTB as follows:

MTB, i.e. mechanical textual behaviour, refers to the actual arrangement of signs in the medium of storytelling, and such an arrangement is decided by the nature of the medium while it is influencing and influenced by the interpreter's act[22] upon the narrative content via the medium.

For example, in the case of the most commonly known codex-reading process where the book is made of paper and the paper is cut into pages to form the book without any paper engineering involved, the narrative content is what is printed on all pages (i.e. words, images and other signs), and the medium is paper. The nature of paper decides that the arrangement of the printed signs on each page is fixed. Such arrangement forms meaning on each page that 'instructs' the interpreter to keep turning pages to get the whole story. The interpreter cannot change the printed signs in any way expect, perhaps, writing on it or tearing up some pages.

For another example, the case of pop-up books is different from the one given previously. The medium of the story presented in a pop-up book is, most commonly, paper (e.g. thin paper or thick paper board), and the narrative content is still what is printed on the paper. However, for pop-up books, the actual arrangement of signs can vary depending on how the interpreter approaches or is led to approach the book. For instance, in the picturebook *The Jolly Postman* (Ahlberg and Ahlberg, 1986), there are movable letters inserted in the envelopes stuck to some

[22] An interpreter's act can be, for example, lifting a flap in a picturebook, turning a page, activating a hotspot on a touchscreen.

pages. When the interpreter opens a page that contains an envelope which has a letter in it, the arrangement of signs on that page suggests that there might be some hidden objects (the letter). Receiving this message/hint, the interpreter is very likely, out of curiosity, to explore the hidden objects. Once the interpreter takes out the movable letter from the envelop, s/he changes the arrangement of signs on that page by adding new signs that were hidden before. How and where the interpreter displaces the letter will also influence the arrangement of the signs presented on that page.

For narrative apps, the medium is the touchscreen or touchscreen technology, and the narrative content is everything that is programmed to be presented on the touchscreen. The nature of the touchscreen (technology) makes it possible to present dynamic signs before the interpreter takes any action upon it. In such a situation, the actual arrangement of signs in a scene on a touchscreen may vary every few seconds if the scene is designed with dynamic signs that change their positions randomly from time to time. For example, in *The Poppin Princess* (2013/2013), there is a scene where two butterflies fly from one flower to another. The flying route of the butterflies is not fixed, so it is likely that the interpreter might be presented with different arrangements of signs in the same scene although such variety of arrangements might not affect the meaning within the story very much.

So far it seems to be clear that it is the influence of the medium on the MTB that subsequently affects what the interpreter may receive and how the interpreter may react to the narrative content. It thus turns out that it is very important to understand the mechanical layer of the storytelling mechanism (in the narrative app) before moving to the interpretative layer. Therefore, the following discussion in this chapter will explore the mechanical layer of the storytelling mechanism with a focus on the MTB and its relationship with the interpreter's action on the narrative content via the medium. The interpretative layer of the storytelling mechanism, i.e. how meaning is constructed as a result of the collaboration among the three elements of the storytelling mechanism, will be covered in the next chapter.

The Mechanical Layer of the Storytelling Mechanism

Medium

Among the three essentials in the storytelling mechanism, the concept of medium needs clarification. The definition of medium varies in different disciplines. In this research, 'medium' is used strictly as *a physical conduit for directly presenting narrative content for storytelling; such a conduit is not regarded as passive, but is seen as being actively involved in shaping and influencing the formation and the reception of the narrative content*. This is an interdisciplinary definition as it partially takes the definitions of medium from media studies, narratology, social semiotics and cybertext theory, but it is also different from any definition in these disciplines in terms of the ground where it stands.

Firstly, in media studies, 'media' can be read, most of the time, as a shortened term for mass media, and are often studied in the context of culture and society (e.g. Durham and Kellner, 2009; McLuhan, 1994; Rayner, Wall and Kruger, 2001). In this thesis, 'media' is not a short term for mass media, but is used solely as the plural form of 'medium' referring to the material channels for presenting the narrative content. Moreover, the focus of this thesis is not on the cultural influence on/of the medium, but on the influence of the medium on the MTB which consequently influences the interpreter's actions upon the narrative content.

Secondly, in the studies of narratology, 'medium' is considered as 'a wide variety of phenomena' which is similar to the understanding of medium in media studies (Ryan, 2014, p.468). For example, in narratology, music and painting are considered as media of art, while printing is the medium of writing (ibid.). However, the concept of phenomena is too broad for the purpose of this research. In this thesis, 'medium' is used as an actual physical conduit to carry and to influence the information. For example, for this study, music will not be considered as a medium, but as an art or narrative form, while musical instruments are media of music; language, images, and sound are the expression, while paper, screen, audio equipment and other material used to directly present words, images and sound are regarded as media.

Thirdly, in social semiotics, particularly in the studies of multimodality, the concept of the medium is very broad, covering all kinds of meaning carriers. Moreover, studies of

multimodality investigate the medium in terms of its semiotic relationship with signs, but not its mechanical relationship, meaning that a multimodal view of the medium is related to the message receiver's meaning-making of the message under certain cultural and social construction (e.g. Kress and Van Leeuwen, 1996 & 2006; Kress and Van Leeuwen, 2001), but multimodal researchers do not seem to have much interest yet in studying *separately* the previous step before meaning-making where signs are displayed and formed by the mechanical influence of the medium. In other words, multimodality studies focus on the meaning of signs (i.e. What are there and how can we understand them?). Their frameworks appear to be ineffective in answering the origins of signs (i.e. where are the signs come from? Or how do they end up there?). In contrast, the concept of medium in this thesis is narrowed down to the scope of storytelling instead of all kinds of meaning-making. Within this scope, what will be discussed is the mechanical layer of the storytelling mechanism, that is, the arrangement of signs and its relationship with the interpreter's action, i.e. the origins and the behaviours of signs. Meaning carried by the signs or added by the medium to the signs, i.e. how we interpret what we see, will not be considered or discussed in this chapter.

In fact, the closest concept of medium to the one used in this thesis is from cybertext theory that focuses on 'the mechanical organisation of the text [… while positing] the intricacies of the medium as an integral part of the literary exchange' (Aarseth, 1997, p.1). Like cybertext theory, this thesis also discusses the medium from a mechanical perspective. However, 'medium' used in this thesis is considered as a physical agency of storytelling, while the cybertextual medium refers to a material component of the cybertext (p.21), although such a difference is not intrinsically distinctive[23].

Cybertext Theory

Cybertext theory has been mentioned in this thesis several times so far. It is thus necessary to give a thorough introduction to this theory before moving on to explore the mechanical layer of the storytelling mechanism. It is fair to say that cybertext theory is the inspiration and a key theoretical base of the storytelling mechanism theory.

[23] Based on my understanding of Aarseth's (1997) cybertext theory, a cybertext is first of all a mechanism, or an organisation through which literature of various kinds are produced. If we consider storytelling as a process that produces literary content, it might be fair to say that storytelling mechanism in this thesis is similar to Aarseth's cybertext. However, there is a slight difference between the two mechanisms. Cybertext only considers verbal signs, but storytelling mechanism considers all kinds of signs. In this case, cybertext may be considered as part of storytelling mechanism.

The Context

As suggested previously, the mechanical layer of the storytelling mechanism is the crucial factor that influences how a text can be constructed and interpreted, while the nature of the medium seems to be a key factor causing multiple MTBs. It can be thus inferred that the nature of the medium has fundamental influences on the whole organisation of the storytelling mechanism, i.e. it has fundamental influences on the possibilities of the arrangements and the perceptions of signs. Thus, it seems that understanding the nature of the medium (i.e. it's function and its relationship with other elements in the mechanism) is a key to understanding how storytelling works.

Regarding the studies of media functions, so far, most of the research and theories take a similar approach, that is, they study the functions of a particular medium or a group of media based on observations of the existing and possible MTBs in the medium/media. For example, narratology and picturebook theory were developed based on the MTBs found in print materials. Although they might be, to some degree, applied to digital (children's) literature (as seen in e.g. Mackey, 2007; Ryan, 2014), they do not appear to be capable of dealing with the formation and the arrangement of signs other than the meaning of the signs in the digital texts. Game studies (e.g. Raessens and Goldstein, 2011) and studies on electronic/digital literature (e.g. Wardrip-Fruin and Harrigan, 2004 & 2007 & 2009; Wardrip-Fruin, 2009) are based on works created for digital platforms. Thus, their frameworks may not be suitable to analyse other media behaviours.

In addition, it seems that most of the theoretical approaches regarding storytelling restrict their scopes to a particular medium or a group of media. Such approaches, although having unique strengths in understanding thoroughly how particular media function, may have two major limitations. The first one is that, they seem to suggest that the same medium always functions in the same way, while there seem to be fundamental functional differences between different media (e.g. digital and non-digital media), but such an assumption has not been justified. The second limitation is that they count on what exists (in media behaviours) rather than what might be possible, which, as Eskelinen (2012) argues, 'seriously undermines their explanatory and analytical power' (p.1). From this study's perspective, such methodologies may also prevent a full exploration of the affordances of different media.

Eskelinen's (e.g. 2001 & 2012) radical attitude towards hegemonic theories have received some disapproval from his peers. For example, Hayles (2001), a crucial figure in digital humanities, believes that Eskelinen's indication of a theory that can do everything is too 'ideological' (n.p.)[24]. Despite this, Eskelinen's idea of literature and its theories (i.e. poetics) echoes with those expressed by Todorov (1977) and Genette (1988) in the late 20th century. Todorov defines poetics as 'a sum of possible forms: what literature can be rather than what it is' (p.33), while Genette specifically argues that

> poetics in general, and narratology in particular, must not limit itself to *accounting for* existing forms or themes. It must also explore the field of what is possible and even impossible without pausing too long at the frontier, the mapping out of which is not its job. (p.157)

Although it seems that most of the theories we have so far *do* limit themselves to the existing forms, and may consequently lack heuristic power for 'inventing practice' (ibid., p.157), this is not to suggest that the existing forms are not worth any investigation, nor to underestimate the strengths of these theories in their particular approaches. Solely from the perspective of exploring the affordances of different media, it seems that cybertext theory appears to be more powerful than other theories as it does not restrict itself to any particular medium, and its vision seems to have gone beyond what a medium can or cannot do, but to the possibilities and even impossibilities of media functions (Eskelinen, 2012).

The Theory

Cybertext theory was developed by Aarseth in the 1990s (Aarseth, 1991 & 1994 & 1997). The theory explores textual communication at a mechanical level, not at a semantical level, which seems to be the opposite approach of social semiotics. In short, cybertext theory considers a text as a mechanical device consisting of the verbal sign, the material medium and the human operator. This textual machine produces two kinds of signs, and has seven traversal functions, which altogether give rise to 576 textual possibilities to describe any kind of textual communication.

In detail, a text, as a mechanical device, produces two strings of signs, namely *scriptons* and *textons*, 'which may (but does not have to) make sense to a given observer' (Aarseth, 1997,

[24] It is an online source from *Electronic Book Review* that does not provide page number for its articles.

p.62). *Scriptons* refers to 'strings [of signs] as they appear to readers', and *textons* refers to 'strings [of signs] as they exist in the text' (ibid., p.62). They may not always be the same.

In my understanding, *textons* are information pieces or signs stored in the text. They are the 'raw material' that have not been rearranged in any way to show to the human operator in the material medium. *Scriptons* are information pieces or signs displayed, arranged or rearranged in the medium for the operator, but do not necessarily have to be seen, to be sensed or to be understood by the operator, nor is it necessarily a result of the actions of the operator[25]. The theorist specifically notes, 'Scriptons are not necessarily identical to what readers actually read […, but instead] what an "ideal reader" reads by strictly following the linear[26] structure of the textual output' (ibid., p.62). This means that as long as the strings of signs have the potential to appear to the human operator on the material medium, despite the fact that they might not have appeared during the actual reading, such signs may still be considered as scriptons. It can also be inferred that the number of scriptons is either the same as that of textons (in this case, scriptons are textons), or greater than the number of textons (in this case, scriptons are not textons).

For example, in a flip-flap book (i.e. a lift-the-flap book), all the signs (including paratexts[27]) displayed on each page (including cover pages) are textons. Scriptons are the combinations of these textons, i.e. the patterns that can be possibly got by lifting different flaps in different readings. Thus, for a flip-flap book, the scriptons and the textons are not the same. There are more scriptons than textons as the reader can form various patterns of signs with the limited number of pages (i.e. flaps).

For a print book, if it does not involve paper engineering, and if it requires the reader to read from page to page and from the beginning to the end, its scriptons and textons are the same. They both are the words, images, etc. printed on all the pages because what can appear to the ideal reader are exactly what is stored (printed) in the book.

For narrative apps, textons are all the signs (e.g. visual, verbal and auditory) designed to be

[25] My understanding of scriptons is similar to Eskelinen's (2012) but different from Porter's (2003).
[26] 'Linear' here means 'sequential' as in sequential textual output. It does not refer to the content of the text as in literary studies.
[27] For a definition of paratexts, see Genette (1997).

stored in the app no matter whether they have been activated to appear. Scriptons are signs presented to the interpreter. Such a presentation may vary to various degrees. This is because firstly, the dynamic signs change their position, and each position may be considered as a different scripton. Secondly, if there are hotspots in the narrative app, a scene (a group of scriptons, or an integrated scripton) with all hotspots triggered is different from a scene with some/no hotspots triggered. As a result, for a narrative app, its scriptons and its textons may not be the same. Most of the time, its scriptons should be more than its textons.

There are situations where new textons can be added to the text, permanently or temporarily, which consequently affects the numbers of scriptons of the text. For example, one can write notes on some pages of a book, and such handwriting stays permanently with the rest of the printed signs. In this case, the interpreter inserts new textons to store in the text (the book), and dependent on the kind of the book (e.g. codices or those with paper engineering), the number of scriptons may vary with the insertion of the new textons. In some narrative apps, the software allows the interpreter to take a photo of herself/himself, draw or write something to be stored temporarily in a scene. Such signs are also new textons created by the interpreter.

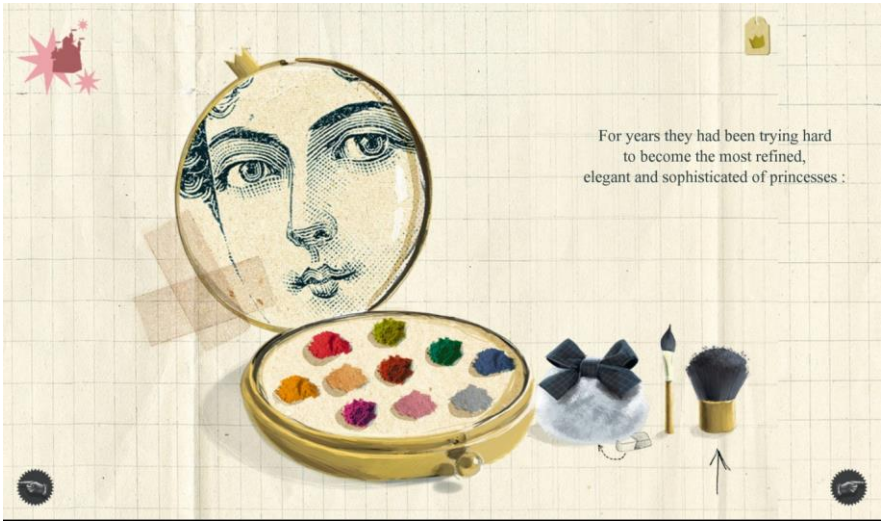

Figure 3-2: A screenshot of an NS in *The Poppin Princess* (2013/2013). In this scene, the interpreter is supposed to apply makeup onto the face using provided colours and tools. However, the interpreter can in fact use the tools and colours to draw or write anything on anywhere of this scene. Therefore, dependent on the actual input of the interpreter, the number of textons of this app can be fixed or unknown while the content of textons is not fixed.

Figure 3-3: A screenshot of an NS in *Jack and the Beanstalk* (2014/2017). In this scene, the interpreter is asked to help Jack restore the broken mirror. Once the mirror is restored successfully, the camera of the tablet computer will be automatically activated and will take a photo of whatever captured by the camera (such as the drawing of a person in the figure). Although what may be captured by the camera varies greatly, the number of times to input any data for this scene is only one. Therefore, the textons of the app (where this is the only scene that allows a temporary data input) has a fixed number, but unfixed content.

The number of textons of a text can be fixed or unknown. For example, in a printed book, where we do not consider the inserted handwriting by the interpreter, there is a fixed number of textons. For narrative apps, the cases may vary. In some apps, such as *The Poppin Princess* (2013/2013) where the interpreter is encouraged or required to offer input to the text, the content of textons varies while the number of textons can be fixed or unknown as the interpreter can input anything as little or as many as s/he wants. (see figure 3-2). In some other apps, where the software does not allow the interpreter to input any data or only allows the interpreter to input limited data, the number of textons is fixed while the content of textons may vary (see figure 3-3).

Apart from scriptons and textons, the textual machine consists of a traversal function – 'the mechanism by which scriptons are revealed or generated from textons and presented to the user of the text' (ibid., p.62). This function contains seven variables. Here I quote the theorist's explanation of the seven variables in full as they are key concepts for my later discussion:

1. *Dynamics*: In a static text the scriptons are constant; in a dynamic text the contents of scriptons may change while the number of textons remains fixed (intratextonic dynamics, or IDT), or the number (and content) of textons may vary as well (textonic dynamics, or TDT).

2. *Determinability*: This variable concerns the stability of the traversal function; a text is determinate if the adjacent scriptons of every scripton are always the same; if not, the text is indeterminate.

3. *Transiency*: If the mere passing of the user's time causes scriptons to appear, the text is transient; if not, it is intransient.

4. *Perspective*: If the text requires the user to play a strategic role as a character in the world described by the text, then the text's perspective is personal; if not, then it is impersonal.

5. *Access*: If all scriptons of the text are readily available to the user at all times, then the text is random access (typically the codex); if not, then access is controlled.

6. *Linking*: A text may be organi[s]ed by explicit links for the user to follow, conditional links that can only be followed if certain conditions are met, or by none of these (no links).

7. *User functions*: Besides the interpretative function of the user, which is present in all texts, the use of some texts may be described in terms of additional functions: the explorative function, in which the user must decide which path to take, and the configurative function, in which scriptons are in part chosen or created by the user. If textons or traversal functions can be (permanently) added to the text, the user function is textonic. If all the decisions a reader makes about a text concern its meaning, then there is only one user function involved, here called interpretation. (ibid., p.62-64)

In summary, each variable has some values: *Dynamic* has three values – static, IDT and TDT; *Determinability* has two – determinable and indeterminable; *Transiency* has two – transient and intransient; *Perspective* has two – permanent and impermanent; *Access* has two – random and controlled; *Linking* has three – explicit, conditional and non; *User function* has four – explorative, configurative, interpretative, textonic. Based on the possible values of each variable, the theorist used a mathematical formula to work out 576 possibilities of value combinations ($576 = 3 \times 2 \times 2 \times 2 \times 2 \times 3 \times 4$). These possibilities map 576 theoretical media positions in the whole universe of textuality. The theorist believes that any type of texts can be described using the variables in the seven traversal functions. However, this does not mean that all the possibilities exist.

Apart from what has been introduced about the theory, there are another four important concepts in the discourse of cybertext theory. They are concepts of *ergodic*, *nonlinear*, *extranoematic* and *nontrivial effort*.

Aarseth uses the term 'ergodic' to address a special textual behaviour found in some literary texts. A brief definition of ergodic literature is literature where 'nontrivial effort is required to allow the reader to traverse the text' (Aarseth, 1997, p.1). The theorist further explains in *Cybertext* (Aarseth, 1997), 'The ergodic work of art is one that in a material sense includes the

rules for its own use, a work that has certain requirements built in that automatically distinguishes between successful and unsuccessful users' (p.179). For example, Chapter One has introduced an adventure game named Machinarium (Amanita Design, 2015) where the interpreter needs to aid a robot in his adventure. The game has its rules for the interpreter to proceed with the story, but there are no verbal clues. If the interpreter fails to figure out how to solve various puzzles based on visual hints, s/he will be an 'unsuccessful user' for the game.

The concepts of 'successful' and 'unsuccessful' users are helpful to identify an ergodic text, but they are not keys to understand ergodic literature. The term *ergodic* involves three key concepts: *nonlinear*, *extranoematic* and *nontrivial effort*.

In my understanding, an ergodic text consists of two basic features: *nonlinear* and *extranoematic* features. Above all, an ergodic text is a nonlinear text. Here, the concepts of *linear* and *nonlinear* are not used in the same sense as in literary studies, but are similar to those used in game studies. As common literary concepts, *linear* and *nonlinear* are usually used to describe a narrative where events are (or are not) portrayed in a chronological order, or where the narrative does (or does not) follow Aristotle's arc, i.e. a clear beginning, middle and end. However, in cybertext as well as in game studies discourses, *linear* and *nonlinear* are not often used to address the *content* of a text but to refer to the 'shape or structure of the text' (Aarseth, 1994, p. 62). In other words, in cybertext theory, *linear* and *nonlinear* speak of the features of the *physical path* taken by the interpreter on her/his way of traversing the text. To cause less confusion, I hereafter refer cybertextual/video game (non)linearity as *structural (non)linearity* to contrast with *narrative (non)linearity*.

A structurally nonlinear text is defined by Aarseth (1994) as follows:

> [A structurally nonlinear text is] an object of verbal communication that is not simply one fixed sequence of letters, words, and sentences but one in which the words or sequence of words may differ from reading to reading because of the shape, conventions, or mechanisms of the text. (p.62)

Aarseth (1997) further explains in *Cybertext*, a structurally nonlinear text must have 'the ability to vary, to produce different courses' (p.42-43). Although Aarseth only considers 'verbal communication', the definition of nonlinear text can also apply to visual communication. I will

hereafter discuss structural (non)linearity in the context of both verbal and nonverbal communication.

Briefly speaking, my understanding of a structurally linear or nonlinear text is: when different traverses of the interpreter in the text cause different *scriptons* to appear, such text is *structurally nonlinear*; otherwise, when same scriptons appear in the text no matter who traverses it or how many times it is traversed, such text is *structurally linear*.

In other words, due to its convention or mechanism, a *structurally linear* text allows the interpreter to take one and only one physical path through the whole exploration of the text. For example, the first printed edition of *Alice's Adventure in Wonderland* (Carroll, 1865) requires an ideal reader to read from the first page to the last, and thus the reader is only given one physical path to complete the reading.

A structurally nonlinear text provides more than one path or possibility for the interpreter to have different experiences of a complete story (or of signs). In such texts, the interpreter is usually required to make one out of many choices to proceed with the story. Once one path is taken, the ideal interpreter is not allowed to go back to explore other paths before finishing the chosen one. Such examples can be seen in both print and digital literature.

For example, in the famous work by B. S. Johnson (1969), *The Unfortunates*, every chapter of the book is bound together but all the chapters are loosely bound, so the reader can read the chapters in any order. However, an ideal reader can only choose one sequence to read through the book. If s/he wants to experience another version of the book, s/he has to restart the reading in a different order.

As for digital literature, one may see this structural nonlinearity in the narrative app *The Ogress* (2012/2012) where, in the middle of its narration, the interpreter is asked to choose one out of three options to keep going (see figure 3-4). Each option leads to one path that reaches a different ending of the story.

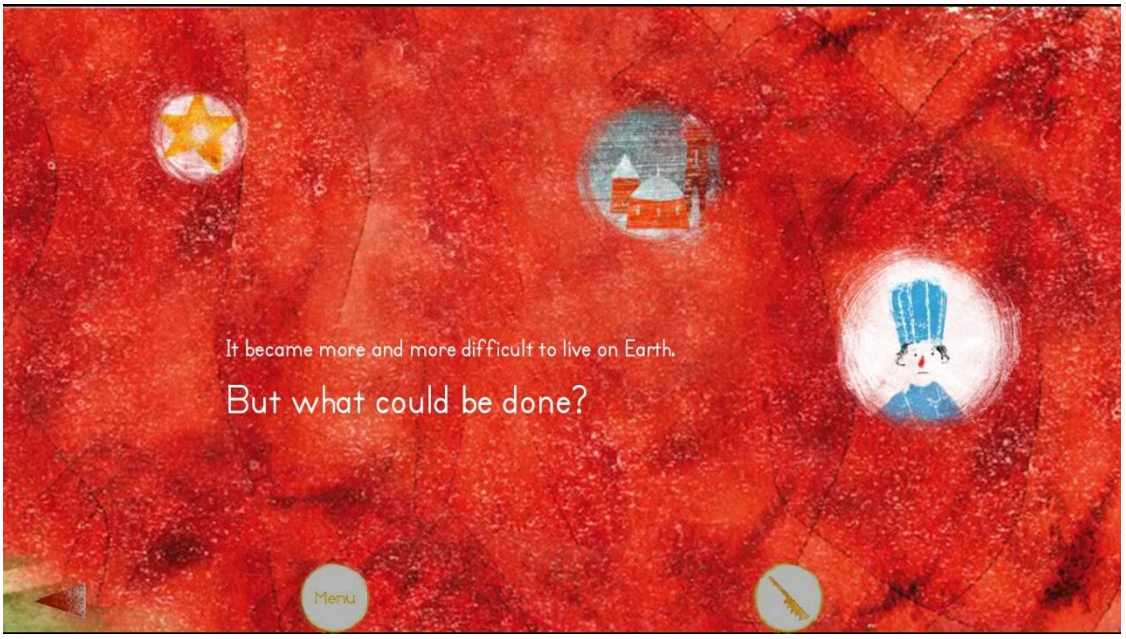

Figure 3-4: A screenshot of an NS in *The Ogress* (2012/2012). In this scene, there are three icons: a star, houses, and a chef. They lead to three different development of the narrative respectively. The interpreter needs to tap on one of the icons to proceed. Once the hotspot is triggered, the ideal interpreter cannot go back to explore other possibilities but to finish with the chosen path.

Structural nonlinearity brings another feature to an ergodic text, that is, the *extranoematic* feature. Extranoematic is a conglomerate word consisting of extra (outside) and noematic (of a noema, i.e. of mind or thought), meaning something that happens outside the mind. Aarseth (1997) uses *extranoematic* to refer to the physical effort exercised by an interpreter to traverse the text based on the text's own mechanism or design. When the physical effort is a 'selective movement [… ,] a work of physical construction that the various concepts of "reading" do not account for', and by this selective movement, the human operators 'have effectuated a semiotic sequence' that constitutes part of the final text, such extranoematic effort is addressed as *nontrivial effort* (Aarseth, 1997, p.1). On the other hand, trivial effort is described by the theorist as the effort 'with no extranoematic responsibilities placed on the reader except (for example) eye movement and the periodic or arbitrary turning of pages' (p.1-2).

Evaluating the Theory

Cybertext theory provides a perspective on how texts are formed (or generated) mechanically. This perspective has a strong focus on media functions, but at the same time, it can also be free from media. Its typology of textual communication (576 types) shows that there might not be absolute functional differences between various textual media while similar traversal functions are found in different media. For example, some hypertext fictions designed for digital media

have some of the same traversal functions as those in create-your-own-adventure novels in print form as they both can be *dynamic* and *determinate*. As the cybertextual typology is theoretical, not an account of empirical examples, cybertextual perspective allows us to study not only how an existing text works mechanically, but to develop new mechanical patterns for literary texts. In this sense, cybertext theory appears to have more heuristic power than most of other theories for studying media behaviours.

While some scholars (e.g. Eskelinen, 2001 & 2012; Montfort, 2000) advocate the cybertextual approach to texts, some others express concerns about this theory. Hayles (2007) points out that cybertext theory is 'blind to content and relatively indifferent to the specificity of media' (n.p.)[28]. Eskelinen (2012) disagrees with Hayles. He argues that firstly cybertext theory was not meant for content analysis, but in spite of this, when Aarseth demonstrates cybertext theory with individual works, his readings attend to content. Secondly, he argues that cybertext theory is in fact sufficiently media specific. As he puts it:

> Aarseth's typology of media positions gives us an empirically verifiable and nuanced map of media behavio[u]r that can be connected to whatever themati[s]ations one may prefer, while maintaining its use value as a conceptual tool in comparisons between literary works and between literary media. (p.25)

I partially agree with Eskelinen that one cannot claim that the theory is *blind* to content if it was not meant for solving issues arising from textual content. However, by arguing that Aarseth's readings of individual works in *Cybertext* (Aarseth, 1997) are not blind to content, Eskelinen does not seem to have established a sufficient argument to support that the theory itself is good for content analysis. In fact, compared with theories specialised in content analysis, such as literary critical theories and frameworks developed in narratology, cybertext theory does not appear to acquire the same level of analytical power. Rettberg (2001), one of the founders of Electronic Literature Organisation, values Aarseth's (1997) contribution in *Cybertext* by saying that cybertext theory 'provides us a shared language to talk about the computational particularities of different types of electronic texts'[29], but he nevertheless points out that the theory 'does not constitute a scale of aesthetic value'. In other words, cybertext theory may be good at studying the textual presentation at a mechanical level, but it does not seem to be suitable

[28] Hayles article is published in *Electronic Book Review* (*ebr*) that does not provide page numbers for contributions.

[29] Rettberg's article is also published in *ebr* and thus does not have page number.

to study textual meaning or textual aesthetics.

As for Hayles' claim that cybertext theory is indifferent to the specificity of media, I agree with Eskelinen's counterargument. Moreover, contrary to Hayles' belief, cybertext theory seems to have strong emphasis on materiality of the medium. As I argued previously, the nature (materiality included) of the medium has crucial influence on the arrangements and the perceptions of signs. By studying the textual medium, cybertext theory provides a complex system of textual communication where signs are being distinguished into two categories, *scriptons* and *textons*, the behaviour of which is influenced by and influences the traversal functions. This shows that specific materiality of the medium has clear impact on the textual communication. While having strong indications on the specificity of media, cybertext theory does not seem to prioritise any specific medium. With its neutral stance, more neutral than other media specific analysis such as the one offered by Hayles (2002), cybertext theory appears to be better at exploring the potential and affordances of specific media, although it may be less good at analysing specific media in depth.

Apart from Hayles, Wardrip-Fruin (2009) also expresses his concern about the difficulty in identifying scriptons and textons. He argues that there seem to be many textual systems that appear to be difficult to describe in these terms simply because their textons are not easily identifiable. Textons and scriptons are indeed demanding concepts in cybertext theory, which reflects the complex nature of the theory. However, it might not be appropriate to refuse a theory due to its complexity. As for the concepts of scriptons and textons, as Aarseth (1997) specifies in *Cybertext*, the names of the two different kinds of signs are not important, but the difference between them is. This suggests that a crucial contribution of cybertext theory is that it brings our attention to two different types of signs in a text. The difference between them was rarely discussed or perhaps had not been noticed before cybertext theory, yet such difference may lead to fundamental different textual behaviours that consequently may influence the reception and the perception of the text, although to identify such difference requires skills and efforts.

In fact, this study regards the cybertextual scope as the theorist's most precious contribution to scholarship. The theoretical scope of cybertext theory is that the theory is not established on any particular media, which makes its theoretical stance less bias and makes it applicable to studies of various textual media. Moreover, the theory acknowledges that different media may

not have essential functional differences while the same medium (in terms of its materiality) may arguably perform differently in various cases. Such a theoretical starting point clears the barrier set by media specific studies between different media, and allows a new perspective to examine texts. The idea of a textual machine creates conditions of possibility for the rise of the storytelling mechanism theory. However, this study did not fully adopt cybertext theory to study the mechanical layer of the storytelling mechanism, nor was it fully adopted for the whole research on the narrative app. This decision has been made due to four major reasons.

Firstly, the methodology of cybertext theory does not match the goal of this research. The purpose for this study to have created a storytelling mechanism is to have a better view of a narrative text as a *collective product* out of *collaborative efforts* involved in the relationship among the interpreter, the medium and the narrative content. A close reading of the definitions of the seven traversal functions and their values shows that they do not seem to have a strong emphasis (though they do have indications to some degree) on the collaborative efforts. In cybertext theory, there are no clear connections built between each two elements in the textual machine although in reality and in theory the three elements cannot work in isolation from each other.

Eskelinen (2012) later improves cybertext theory by providing more traversal functions (e.g. *user position* and *user objective*) and new values for some traversal functions. However, he adopts the same methodology as Aarseth (1997), and therefore his updated cybertext theory still overlooks the relational impact that each element has on one another. Thus, Eskelinen's updated version of cybertext theory is still not suitable for this study. From this perspective, cybertext theory and the storytelling mechanism theory stand on different grounds.

Secondly, due to the methodological problem, cybertext theory seems to suggest questionable categorisation. Specifically, as cybertext theory seems to ignore the relational impact and the collaborative efforts, it only examines three elements in the textual machine separately despite the fact that it is the theorist who points out that the text production is a collaboration of 'the verbal sign', 'the medium' and 'the human operator'. As a result, cybertextual categorisation has provided some text types that are theoretically *impossible*.

For example, when introducing the four values in *user function*, Aarseth (1997) writes, 'the interpretative function of the user [as one of the four values in *user function*…] is present in all texts' (p.64). This statement alone does not seem to be problematic. However, this statement poses a problem for the validity of his typology. The theorist gets 576 possibilities of textual communication by multiplying the numbers of values of each traversal function, i.e. 576 = 3 values in *dynamics* × 2 values in *determinability* × 2 values in *transiency* × 2 values in *perspective* × 2 values in *access* × 3 values in *linking* × 4 values in *user functions*. Mathematically speaking, this formula means that there are 432 textual positions (3 × 2 × 2 × 2 × 2× 3 × (4-1) = 432) that should not involve the 'interpretative function'. However, this mathematical analysis of the textual positions contradicts both the theorist's statement and the empirical findings according to which all types of texts should have interpretative function. This finding reveals that the actual number of the theoretical textual positions based on different traversal functions is much smaller than the one provided by the theorist.

On the one hand, this logical problem may have weakened the explanatory, analytical and heuristic power of the theory. On the other hand, while theorising a textual machine but studying each element separately, cybertext theory seems to prove its methodology essentially the same as other media specific theories because they all choose to ignore the whole picture of the mechanism of the textual production. Moreover, the methodological problem of cybertext theory seems to suggest that it is vital to have sound criteria when establishing a textual system. Cybertextual criteria, however, do not appear to be logical enough to validate the theory's typological statements. Therefore, this study decided to prioritise criteria of the textual classification over the actual number of the text types.

Thirdly, as I argued previously, the storytelling mechanism has two layers, the mechanical layer and the interpretative layer. Although cybertext theory can answer some questions reflected from the mechanical layer, it does not seem to be capable of dealing with the interpretative layer of the storytelling mechanism.

Fourthly, cybertext theory seems to have some conceptual issues. There are some concepts not clearly defined, which may cause confusion for an accurate understanding of the theory.

The first group of problematic concepts is from the traversal function of *perspective* and its two values, *personal* and *impersonal*. Above all, it is not clear what Aarseth means by 'perspective', whether the word is used to refer to 'prospect'/ 'possibilities', or 'attitude'/ 'point of view'. If it is for 'possibilities', it may be better to just use *possibility* rather than *perspective* as the latter also means 'point of view' which reflects a sense of personal or mental involvement. However, with this traversal function, the theorist's focus is on physical efforts required from the human operator. Mental involvement occurring during the textual traverse is not taken into consideration at all. This reading of *perspective* as being purely physical can be detected from the example given by Aarseth (1997). In further explanation of *perspective*, he writes:

> A text […] pretends to involve the reader as a participant, but there is nothing for the real reader to do but read. In a MUD[30], on the other hand, the reader is (in part) personally responsible for what happens to his or her character. (p.63)

Clearly the theorist talks about physical action here, not mental action of the reader. In fact, the whole cybertext theory mainly considers physical efforts required from the human operator. Thus, using 'perspective' to address a mechanical function might be misleading.

Apart from the problem of the word choice for this traversal function, the word choice for its two values (i.e. *personal* and *impersonal*) may also be problematic. Essentially, when a person starts to get involved in producing a text, this involvement may no longer be considered impersonal. Therefore, it does not matter what kind of 'strategic role' the text may require its 'user' to play, the relationship between the 'user' and the text is personal.

The second group of problematic concepts are found in the traversal function of *access*. *Access* has two values, *random access* and *controlled*. Aarseth (1997) explains that '[i]f all scriptons of the text are readily available to the user at all times, then the text is random access (typically the codex); if not, then access is controlled' (p.63). However, it is not clear what 'readily available' refers to. If it refers to the situation where all scriptons are presented to the human operator at all times, then the access to all the codices are not random as claimed by the theorist. This is because all the scriptons in a printed book (i.e. the codex) are not presented to the reader at all times – the reader needs to turn pages to reveal more scriptons. If 'readily

[30] MUD stands for Multi-User Dungeon, Multi-User Dimension or Multi-User Domain (see Bartle, 2004; Hahn, 1996). It is a type of online computer game based on multiplayer real-time virtual world where players can chat with each other. This is my note.

available' means that the number of scriptons is fixed, then the idea expressed in this traversal function is similar to that expressed in *dynamics* (the 1st traversal function) where the theorist discusses about fixed and unfixed scriptons and textons. In this case, in the total number of 576 textual positions, there would be a great number of textual positions that repeat one another. If 'readily available' indicates the situation where traversing the text does not require physical efforts from the human operator because all the signs are presented, then this traversal function of *access* may make some sense, but in this case, it would be better to be specific about the criterion of 'physical efforts'.

Apart from the conceptual issues, cybertext theory contains some complex concepts that may be simplified to be more specific. For example, it seems that the criterion used to differentiate a trivial and a nontrivial effort is whether a 'selective movement' is involved in the textual traverse, or in other words, whether the operator is required to pick a route (or routes) out of many offered by the text's mechanism to complete her/his operation. If my understanding is correct, it seems that the term 'extranoematic' may be replaced by 'physical', and 'nontrivial effort' by 'selective physical movement/effort', especially considering that the term 'trivial' may have some insignificant connotation while the quality of a text should not be solely judged by the text's ability to offer intricate traversal routes to its interpreter.

However, this study by no means devalues the contribution of cybertext theory to scholarship. In fact, when many studies tend to draw a line between digital and non-digital literature, cybertext theory seems to have erased this borderline. Undoubtedly, the theory offers a more neutral and inclusive perspective that is applicable to studying texts of various kinds. This perspective is significant in the studies of digital literature such as the narrative app.

That being said, this thesis proposes a different methodology from the cybertextual one to study the nature of storytelling. This methodology follows cybertextual scope, emphasises the difference between two strings of signs produced in a textual machine, adopts the basic ideas in some traversal functions proposed by cybertext theory, but to avoid overlaps of text types, it explores the collaborative efforts involved in the relationship among all the elements in the storytelling mechanism as well as the functions of each individual element. Based on this methodology, I have developed a new typology of narrative texts that constitutes a crucial part of the storytelling mechanism theory.

New Typology of Narrative Texts

The previous discussion has pointed out that many media may share the same MTBs, i.e. the same principle of arrangement of signs. For example, films on the screen and paintings on the canvas are the same in terms of the principle of arranging signs. In films, the signs are moving, but the arrangement or the combination of the moving signs remains the same during different projections. Paintings have still signs, so the arrangement of signs stays the same every time when the paintings are displayed to the interpreter. In both situations, the interpreter may change positions to receive the signs, which will cause different perspectives for the interpreter, but different perspectives do not change the display of the signs in any way physically. This thesis proposes to use the term *stable* to address this kind of MTB, that is, the arrangement of signs (e.g. visual, verbal or tactile, dynamic or still) does not change physically compared with that in any other time when being traversed by any interpreter.

The term *traverse* is borrowed from cybertext theory in which the term is not given explicit explanation. In this thesis, I use the term to refer to *the action of the interpreter to travel through the narrative content. Such an action is restrained by the rules of the storytelling mechanism which may or may not require necessary physical operations on the part of the interpreter*. Necessary physical operations include, but are not limited to, moving one's eyes or angles to examine art pieces, turning pages, swiping, tapping, blowing on the touchscreen, accomplishing physical tasks required by the textual machine to continue to traverse, etc.

The example of MTBs in films and paintings suggests that although the medium has significant influence on the MTB, different media can have the same MTBs, which indicates that the study of the MTB can be independent of the medium.

The subtle relationship between the medium and the MTB gives rise to an original typology of narrative texts where both digital and non-digital formats are considered. Such a typology can be used to clarify how narrative apps work at a mechanical level, and whether such an app mechanism is revolutionary.

Precisely, I examined MTBs in different major stable and unstable media of storytelling, for example, a canvas and its frame for paintings, different materials for sculptures, paper in books

with or without paper engineering, a screen for moving images such as TV programmes, films and animations, a computer (touch)screen for digital stories, and performers for different occasions of storytelling. Based on the MTBs on these media and their influence on the interpreter's action on the narrative content via the media, I developed 35 logical questions that can be used to enquire about a narrative text, digital or non-digital. Using these questions, we can describe any narrative text in terms of their MTBs (see figures 3-6 and 3-7). These 35 questions are:

1. Is the medium[31] stable?
2. Are all the signs (e.g. visual, verbal, auditory or tactile, dynamic or still) that are embedded in the text presented to *the ideal interpreter*[32] via the medium *during* the *instant moment*[33] of the ideal interpreter's traverse?[34]

[31] If more than one medium is used in storytelling, 'the medium' will refer to an integration of all the physical conduits used to *directly* present the narrative content. This concept applies to all 35 questions. If any one of the physical conduits is unstable, it will be considered to make the integral whole unstable. For example, in the case of a storyteller using a projection screen to tell stories, the medium as an integral whole includes the storyteller and the projection screen. Since the storyteller does not have consistent performance, and therefore is an unstable medium, although the projection screen is stable, the integral whole is considered unstable.

[32] 'The ideal interpreter' refers to the interpreter who strictly follows the linear output of the text and makes her/his decisions about how to traverse the text accordingly.

[33] To explain 'instant moment', I need to explain a concept of *complete traverse*. I use 'complete traverse' to refer to the situation where the interpreter completes all necessary physical tasks (e.g. turning a page, tapping on a hotspot on the touchscreen) and travels through all the necessary parts of the text so that s/he is considered to have had a complete experience of (one version of) the narrative. In this thesis, 'a complete traverse' is considered as being constituted by various moments. The length of each *moment* is adjustable based on the purpose of the inquiry. For example, when the interpreter opens a book to read, the complete reading can be divided into the subsequent moments of individual page-readings. The examination of each momental piece of the traverse still considers the collaborative efforts involved in the relationship among the interpreter, the medium and the narrative content. 'Instant moment' thus refers to a single moment of the traverse, or a *momental piece* of the traversal experience where certain number of textons are presented to the interpreter as scriptons in the medium. Thus, question 2 enquires about whether all the textons are presented to the interpreter as scriptons in a single momental piece of the traverse.

[34] Question 2 is a reconstruction of the traversal function of *access* in cybertext theory. It deconstructs the concept of 'readily available' so as to cause less confusion.

3. If the answer to question 2 is 'yes'[35], are all the signs embedded in the text presented to *the ideal interpreter* via the medium with the *same arrangement*[36] during the *same moment*[37] of *different traverses*?

[35] The *premise* of this question as well as of question 5 and 7 is that all the textons are presented to the interpreter as scriptons in the instant moment of the traverse, but it does not mean that the scriptons are the same. This is because textons are not equal to scriptons. Textons exist without any order nor with any fixed position to one another. Scriptons, however, have both order and position because scriptons are related to textual presentation. A scripton can be understood as containing the content of one texton or certain number of textons, and this number of content can be combined in various orders or to be put in various positions in relation to each other and to other presented content. For example, imagine there is a piece of software whose database consists of four related pictures, i.e. the textons are four pictures. When the software runs, it will show all the pictures at once on the screen but they are combined in a certain sequence to show to the audience, and the presentation does not require physical engagement from the interpreter. However, the combination of these pictures on the screen may vary. What is presented to the audience may be four pictures in a line in the order of 1, 2, 3, 4, but the presentation can also be of four pictures in a line in the order of 4, 3, 2, 1, or of four pictures not lined up, but two pictures on the top and two on the bottom of the screen, and so on so forth (see figure 3-5). This change of presentation can happen in one complete single traverse, meaning that the order and the position of these four pictures on the screen change from time to time. The change can also happen in different traverses, meaning that in one complete single traverse, the order and the position of these four pictures remain fixed, but in another traverse, the order and/or the position of the pictures change. In these cases, all the textons are shown to the audience in an instant moment, but the scripton (as the combination of textons) is not the same in an instant moment of different presentations. In other words, even if all textons are presented as scriptons to the interpreter, each momental piece of a complete traverse is not necessarily linked with fixed scriptons in the sense of both their content and their position to each other.

[36] 'Same arrangement' refers to the situation where both the content and the position of the scriptons and their adjacent scriptons are the same.

4. If the answer to question 3 is 'no', are the variations of the arrangements of the signs limited[38]?

5. If the answer to question 2 is 'yes', are all the signs embedded in the text presented to *the ideal interpreter* via the medium with the *same arrangement* during *different moments*[39] of the *same traverse*?

---

[37] This question enquires about the stability of signs in a specific momental piece of the traverse where all the textons are presented as scriptons. Specifically, if we assign a number (such as 1, 2, 3…) to each momental piece of the first traverse of an ideal interpreter, and assume that this ideal interpreter has done several other times of complete traverses of the same text too, 'same moment' refers to all the momental pieces under the same number in all these traverses. In other words, question 3 investigates whether in the same momental piece of different traverses, the scriptons have the same content and in the same position to each other in the medium. It is important to point out that the length of every momental piece in a complete traverse is not necessarily the same. However, if we are to compare two complete traverses, the corresponding momental pieces in two traverses must have the same length. In other words, piece no. 1 in the first traverse must have the same length as piece no. 1 in the second traverse. There is another important point to make here, that is, the lengths of two complete traverses of the same text are not necessarily the same. For example, the narrative app *The Ogress* (2012/2012) (see figure 3-4) has three different fabulae. An ideal interpreter is allowed to pick up any fabula and reach the corresponding ending to finish one complete traverse of the app. This means, the app is capable of providing three different complete traverses to an ideal interpreter. As the narrative content is different in each complete traverse, the time for an ideal interpreter to finish a complete traverse may be different.

[38] The number of variation is considered to start with 0, i.e. from no variation to many.

[39] This question enquires about the stability of signs in a complete traverse of the ideal interpreter, that is, in this single complete traverse, whether each and every momental piece of the traverse is linked with exactly the same scriptons. In other words, whether the scriptons remain the same both in content and in position to each other all through the traverse. For example, a word is written on a piece of paper, and all that a reader needs to read is just whatever presented on this one piece of paper, so everything is presented to the interpreter as fixed scriptons, meaning that the content and the position of all scriptons on this piece of paper do not change. Assume that the ideal reader is required to look at this word for 10 minutes. We can divide this traverse into 10 momental pieces, each containing 1 minute of the traverse. In every minute, what presented to the interpreter is the same scripton with the same content and the same position on this piece of paper, i.e. all the signs are presented to the interpreter with the same arrangement during different moments of the same traverse. Note that in a text, when scriptons remain the same for an ideal interpreter's one single complete traverse, this does not guarantee, or we should not assume that the scriptons will not change for the ideal interpreter during her/his other traverses. Therefore, there is a follow up inquiry about this possibility in question 7.

6. If the answer to question 5 is ‘no’, are the variations of the arrangements of the signs limited?

7. If the answer to question 2 is ‘yes’, are all the signs embedded in the text presented to *the ideal interpreter* via the medium with the *same arrangement* during *different moments* of *different traverses*[40]?

8. If the answer to question 7 is ‘no’, are the variations of the arrangements of the signs limited?

9. Do the signs *presented*[41] require physical involvement(s) on the part of the ideal interpreter to traverse?[42]

10. If the answer to question 9 is ‘yes’, do(es) the involvement(s) require selective movement(s)?

11. If the answer to question 9 is ‘yes’, do(es) the physical involvement(s) change the arrangement of the signs?

12. If the answer to question 9 is ‘yes’, is/are the physical involvement(s) supposed to be conducted in a certain sequence?

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[40] This question enquires about the stability of signs in different traversal experiences of the ideal interpreter, that is, comparing different traverses of the ideal interpreter, whether the scriptons remain the same in all momental pieces of all the traverses even when the ideal interpreter traverses the text for a different time. The example given in footnote 37, a word written on a piece of paper, suits the description in this situation, that is, all signs are presented to the ideal interpreter during different moments of different traverses.

[41] ‘Presented’ here refers to the signs that are shown to the interpreter from the very beginning, and they do not hide themselves and then appear all by themselves at some point of the traverse, nor do they need to be revealed by the interpreter.

[42] This question is a parallel question to question 2, not a sub-question to it. It enquires about the condition of the engagement between the presented signs and the interpreter. For example, in some narrative apps, there are no hidden signs in a scene, but the presented signs can be moved around by the interpreter. In this case, the presented signs requires/invites physical involvement(s) from the interpreter.

13. If the answer to question 12 is ‘yes’, is the sequence permitted to vary in different traverses?

14. If the answer to question 13 is ‘yes’, are the variations of the sequence limited?
15. If the answer to question 12 is ‘no’, are the variations of the random physical involvement(s) limited?

16. If the answer to question 2 is ‘no’, do the unpresented signs need to be revealed by the physical operation of the interpreter in the medium?

17. If the answer to question 16 is ‘yes’, does the physical operation involve *selective movement(s)* on the part of *the ideal interpreter*?

18. If the answer to question 16 is ‘yes’, during one *complete traverse* of the text, is it possible to reveal all the hidden signs in the medium by the physical operation of *the ideal interpreter*?

19. If the answer to question 16 is ‘yes’, are the hidden signs revealed with the *same arrangement* in the medium during the *same moment* of *different traverses* by the physical operation of *the ideal interpreter*?

20. If the answer to question 19 is ‘no’, are the variations of the arrangements of the signs limited?

21. If the answer to question 16 is ‘yes’, are the hidden signs revealed with the *same arrangement* in the medium during *different moments* of the *same traverse* by the physical operation of *the ideal interpreter*?

22. If the answer to question 21 is ‘no’, are the variations of the arrangements of the signs limited?

23. If the answer to question 16 is ‘yes’, are the hidden signs revealed with the *same sequence*[43] in the medium at *the same moment* of *different traverses* by the physical operation of *the ideal interpreter*?

24. If the answer to question 23 is ‘no’, are the variations of the sequences limited?

25. If the answer to question 16 is ‘yes’, are the hidden signs revealed with the *same sequence* in the medium at *different moments* of *the same traverse* by the physical operation of *the ideal interpreter*?

26. If the answer to question 25 is ‘no’, are the variations of the sequences limited?

27. If the answer to question 16 is ‘no’, do all the unpresented signs reveal themselves?

28. If the answer to question 16 is ‘no’, do all the unpresented signs reveal themselves with *the same arrangement* during *the same moment* of *different traverses*?

29. If the answer to question 28 is ‘no’, are the variations of the arrangements of the signs limited?

30. If the answer to question 16 is ‘no’, do all the unpresented signs reveal themselves with *the same arrangement* during *different moments* of *the same traverse*?

31. If the answer to question 30 is ‘no’, are the variations of the arrangements of the signs limited?

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[43] ‘Sequence’ refers to the order of the appearance of each scripton. This question enquires about the behaviour of the scriptons generated by the interpreter during the same momental piece of the traverse. For example, each scene of a narrative app can be considered as a momental piece for the interpreter to traverse. When the ideal interpreter encounters the same scene of the app in various occasions, and when s/he has to physically generate scriptons out of this scene, is there a fixed order to reveal all the hidden textons? This is what question 23 asks about.

32. If the answer to question 16 is ‘no’, do all the unpresented signs reveal themselves with *the same sequence* during *the same moment* of *different traverses* of the *ideal interpreter*?

33. If the answer to questions 32 is ‘no’, is the variation of the sequences limited?

34. If the answer to question 16 is ‘no’, do all the unpresented signs reveal themselves with *the same sequence* during *different moments* of *the same traverse* of the *ideal interpreter*?

35. If the answer to questions 34 is ‘no’, are the variations of the sequences limited?

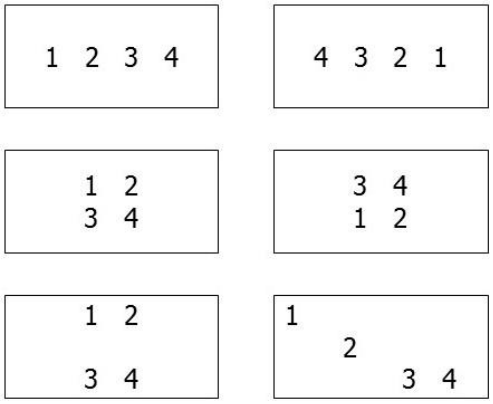

Figure 3-5: An example for Footnote 33. The square represents the screen, and the numbers represent four pictures. The order and the position of the numbers in a square represent a possibility of the arrangement of the four pictures on the screen. Six squares shown in the figure are only six possibilities out of many.

The Rational for the Typology

The sequential relationship of all the questions is visualised in figure 3-6 while figure 3-7 (See Appendix E for two zoomable images for figure 3-6 and figure 3-7) is a visual map constructed out of the possible answers to all the 35 questions. Through the visualisations of the typology, one may see a series of in-depth inquires that investigate the influence of each individual element in the storytelling mechanism as well as the collaborative influence of all the elements in producing a narrative. The inquiries start with the medium as it is the key element that mediates between and influences the other two elements, i.e. without the medium, the narrative content as abstract concepts cannot be materialised to present to the interpreter, and consequently the interpreter cannot process, influence or interpret the narrative content. After enquiring about the stability of the medium (Q1), the following questions (Q2–Q35) examine the status of the signs (i.e. the materialised narrative content) presented in the medium in relation to the effort (mainly physical) offered by or required on the part of the interpreter during the traverse.

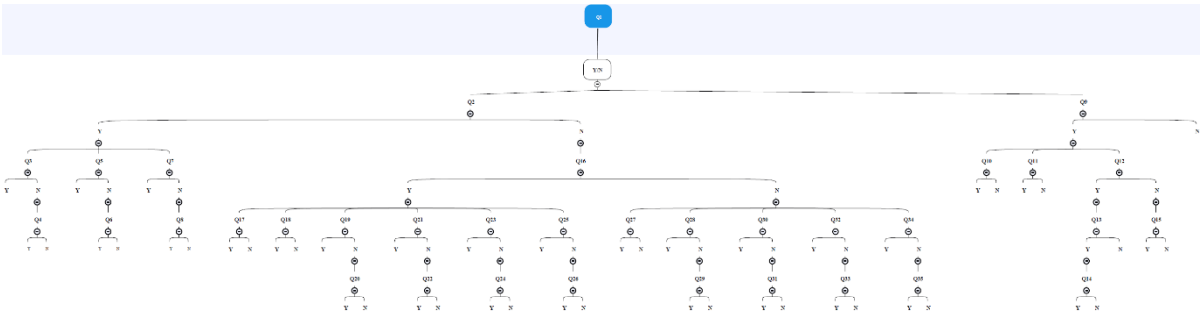

Figure 3-6: A visualisation of the sequential relationship among the 35 questions. A zoomable version of this image is provided in Appendix E. 'Q' is for 'question', 'Y' is for 'yes' and 'N' is for 'no'. 'Y/N' under 'Q1' means both answers, 'yes' and 'no', to question 1 apply to the situations visualised below them.

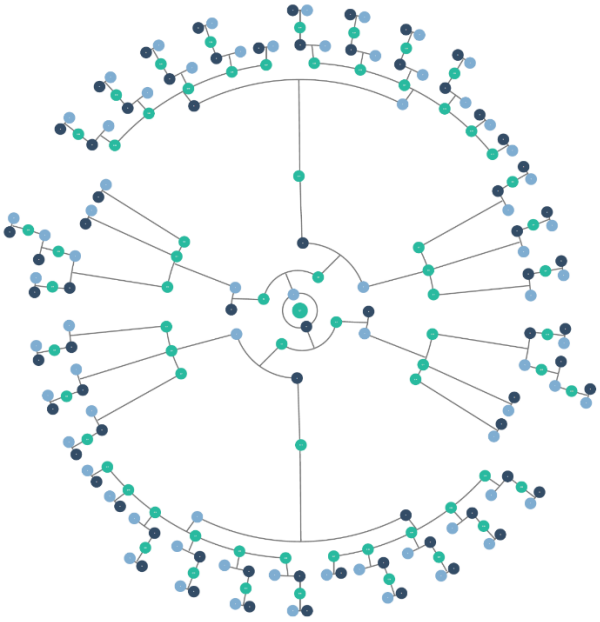

Figure 3-7: Another visualisation of the typology of narrative texts, namely, ***the Storytelling Mechanism Theoretical Route Map***. A zoomable version of this image is provided in Appendix F. This map specifies some possible route through which a theoretical narrative can be generated via collaborative efforts involved in the relationship among the narrative content, the medium and the interpreter. The map is created based on the answers to the 35 questions. Each green dot represents a question. The light blue dot represents the answer 'yes', and the dark navy dot represents 'no'. The travel route starts with Q1 (i.e. the big green dot in the centre of the map). The possible routes to generate /produce a theoretical narrative thus start from the centre, and depending on an answer of 'yes' or 'no', spread to the 'Y'(s) and 'N'(s) at the end(s) of the line(s) leading to the most outer circle.

By answering 'yes' or 'no' to each question, we can give a position to any narrative text by finding its route in the map shown in figure 3-7. The position or the route of a particular type of text may be a matter of debate, but this does not invalidate the presented typology. It is also worth pointing out that the typology is theoretical, and therefore it would not be surprising if one could not yet identify empirical equivalents for some theoretical categories, if there are any. In addition, the chain of 35 questions is strictly linked in a logical way so as to avoid any overlap of text types.

The 35 questions are not (meant to be) exhaustive, as there are many sub-questions that can be added to the chain to make for a more meticulous description of a narrative text. For example, for questions that ask about the arrangement of signs presented to the interpreter, if the answer is 'no' (i.e. the signs are not presented with the same arrangement), we can ask sub-questions to enquire about the ways the arrangement of signs are different, such as [1] whether it is a positional difference where the content of the scriptons and of their adjacent scriptons is the same but their position(s) changes either individually or as a whole; [2] whether it is a semantic difference where the content of the scriptons change but the positions are the same, or [3] whether both the content and the position(s) change. Question 16 asks whether the unpresented signs need to be revealed by the physical operation of the ideal interpreter. If the answer is 'no', apart from what have been asked in questions 27-35, we can also enquire about the ways with which the unpresented signs reveal themselves. For questions 10 and 17 that ask whether the physical involvement(s) involve(s) selective movement(s) on the part of the ideal interpreter, after this question, we can continue to explore what kind of selective movement(s) is/are needed on the part of the ideal interpreter.

By adding sub-questions, one can use the typology to analyse specific media behaviours or textual behaviours in detail. However, it is not the purpose of the current research to map out all the possibilities of textual communication, nor is it possible to do so. Like cybertext theory, this typology, as part of the storytelling mechanism theory, aims to provide a perspective to study how texts work without any prejudice against any particular medium/media. With such a typology, we may be able to explore the second question posed in the beginning of this chapter, namely:

- Has the narrative app brought any element essentially distinctive from the basic elements of storytelling?

The Application of the Typology

Based on the 35 typological questions, it appears that the narrative apps accessed by this study occupy the same coordinates on the theoretical route map as many other texts, digital or non-digital. For the sake of demonstration, I will use four positions in the typology (see figure 3-8), i.e. four routes in the theoretical route map (see figures 3-9, 3-10, 3-12 and 3-14), to elaborate how narrative apps can be approached based on their MTBs, and why such behaviours

do not appear to be revolutionary. For this purpose, each demonstration will start with examples found in non-app storytelling, and then move on to app storytelling to show the resemblance.

The demonstrations are just examples of how the typology can be used to understand different types of texts. There is no intention in this thesis to claim that the four text types shown in figure 3-8 are the only suitable positions to situate the texts used in the demonstrations, and neither does this thesis imply that the four positions are the only empirical ones in the typology.

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
NC	Y	N	0	0	0	0	0	0	N	0	0	0	0	0	0	Y	N	Y	Y	0	Y	0	Y	0	Y	0	0	0	0	0	0	0	0	0	0
	Y	N	0	0	0	0	0	0	N	0	0	0	0	0	0	Y	Y	Y	Y	0	N	Y	N	Y	N	Y	0	0	0	0	0	0	0	0	0
	Y	N	0	0	0	0	0	0	Y	Y	Y	N	0	0	Y	Y	Y	Y	N	Y	N	Y	N	Y	N	Y	0	0	0	0	0	0	0	0	0
	Y	N	0	0	0	0	0	0	Y	Y	Y	N	0	0	N	Y	Y	N	N	N	N	N	N	N	N	N	0	0	0	0	0	0	0	0	0

Figure 3-8: Four text positions in the typology. 'Q' stands for 'question', numbers '1' to '35' represent the 35 questions used to ask about a narrative text. 'NC' stands for 'narrative coordinates', 'Y' for 'yes' to the corresponding question, 'N' for 'no', and '0' for not applicable.

Type One (Route One)

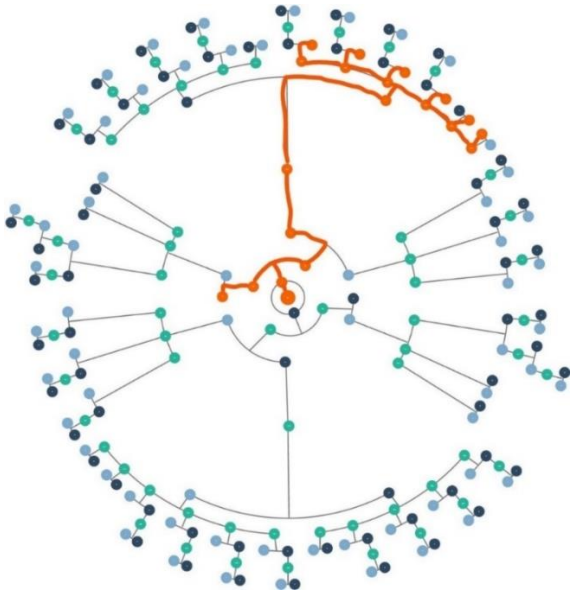

Figure 3-9: Narrative route for Type One. A zoomable version of the image is provided in Appendix G. The orange dots and the orange lines mark out the route through which the generating process of the first theoretical narrative travels. The route occupies 20 dots on the map. The route starts from Q1(the central dot) to Q1-Y, and then goes to both Q2 and Q9. From Q9, it goes to Q9-N. From Q2, it goes to Q2-N-Q16-Y, and then goes to Q17-N, Q18-Y, Q 19-Y, Q21-Y, Q23-Y, and Q25-Y respectively.

The orange row shown in 3-8 represents the first text type for demonstration. The narrative in this text type is generated by following the orange route marked out in figure 3-9. It is the type where the medium is stable, but there are signs not presented to the interpreter who needs to reveal the hidden signs by non-selective physical efforts such as periodically turning (digital)

pages to reveal the signs on those (digital) pages. Such a type allows the interpreter to reveal all the signs within one complete traverse. During different complete traverses, the presented and revealed signs stay with the same arrangement while presented and revealed in the same sequence by an ideal interpreter. This position suits some narrative apps whose hotspots, for example, do not have other functions rather than shifting scenes. It also suits, for example, (picture)books without paper engineering[44] or those that do not offer structurally nonlinear reading experience, pop-up books with only pop-up features, and some hyperfictions that allow readers to click on all the hyperlinks to finish reading the story.

Specifically, for a (picture)book without paper engineering or for those that do not offer structurally nonlinear reading experience, the arrangement of signs, no matter how carefully designed, is fixed on every page. As all the pages of most of the (picture)books cannot be seen at the same time, it is thus considered that when interpreters are reading signs from one page, they are not presented with the signs from the rest of the pages. By turning a page, they reveal some signs that are 'hidden' from them. As (picture)books without paper engineering are designed linearly with one page following the other, it is thus possible for ideal interpreters to reveal all the hidden signs in one complete reading while all the signs are positioned the same during different readings and the content of these signs do not change.

For pop-ups with only immediate pop-up designs and no other engineering strategies such as (re)movable features, the interpreter reveals the pop-up features at the same time as opening the book or turning a page. Therefore, all the hidden signs can be revealed in pop-ups. Turning a page and revealing the pop-up features are, most of the time, simultaneous, so the interpreter's physical action on the books is not considered selective movement. The arrangement of signs in pop-ups is considered stable because the pop-up features are fixed on the pages. It is debatable, though, whether for pop-ups the arrangement of signs is the same during different readings. It we consider only the ideal situation where every time a pop-up is revealed, it pops up with the same dimension, we can say that the arrangement of signs is the same during different readings; otherwise, the arrangement of signs can be different. Depending on the possible variations of the dimension of a pop-up, such pop-ups can have limited or unlimited variations of the arrangements of signs.

[44] Paper engineering include, but are not limited to, book sculptures, the pop-up design, and the flip-flap design.

For some (not all) hyperfictions that require ideal interpreters to click on all the hyperlinks to finish their readings, on each 'page' of the hyperfiction, whether there is sound or moving images, the arrangement of the signs, still or dynamic, is unchanged because the travel routes[45] of the dynamic signs are the same as at any other time when being traversed, such as the case of the first episode of *Inanimate Alice* (Pullinger and Joseph, 2005) whose signs, although dynamic, are fixed in terms of how they are positioned in relation to each other on the computer screen.

In hyperfictions, clicking on a hyperlink is like turning a page. However, depending on the design of the hyperfiction, clicking on a hyperlink can be non-selective movement but can also be selective one when interpreters need to make a choice as for which link to click first on the same 'page'. No matter which design it is, as long as the hyperfiction requires interpreters to click on all the hyperlinks to finish their traverses, all the hidden signs will be revealed by the interpreter with the same arrangement, but may be with different sequences. Specifically, if the hyperfiction only requires non-selective movements on the part of the ideal interpreter, i.e. the hyperfiction requires a fixed sequence to click on all the hyperlinks, no matter how many times an ideal interpreter traverses the hyperfiction, s/he will generate the same scriptons in the same order; if not, the content and the position of the scriptons in each hyper page may vary, and so will the sequence of the appearance of each scripton.

As for some narrative apps containing no engaging features other than hotspots for changing scenes, the principle of arranging signs is the same as that in the hyperfictions and books discussed above. In these apps, tapping or swiping on the touchscreen to turn to the next scene is similar to clicking on a hyperlink or turning an actual page. This type of apps is mostly seen in the first generation of the narrative app development.

An example of such narrative apps is *Love, the App* (2014/2014). This app is a faithful adaptation from the book under the same name. Without considering about the HS (as the HSs across all three generations accessed by this study have similar functions such as giving credits to everyone involved in the app production), each NS of this app contains only one hotspot (excluding the option button, by tapping which, the interpreter can choose to go back to HS, to NS1, or jump to the previous or next NS). The function of this hotspot, apart from engaging the

[45] There are hyperfictions whose dynamic signs do not have fixed route, and thus can travel across the computer screen randomly.

interpreter, is used to help the interpreter move forward in the narrative. Thus, an ideal interpreter is supposed to activate every hotspot in every scene to proceed with the story until s/he reaches the end of the story. Such hotspot activation is not considered selective movement because the ideal interpreter is not offered options during her/his traverse. In every scene, the animated elements, both visual and auditory, have limited number and appear in the same way during different traverses. Therefore, during difference traverses of the app, the ideal interpreter always gets the same scriptons that appear in the same order in the same scene as well as in the whole storytelling process.

Type Two (Route Two)

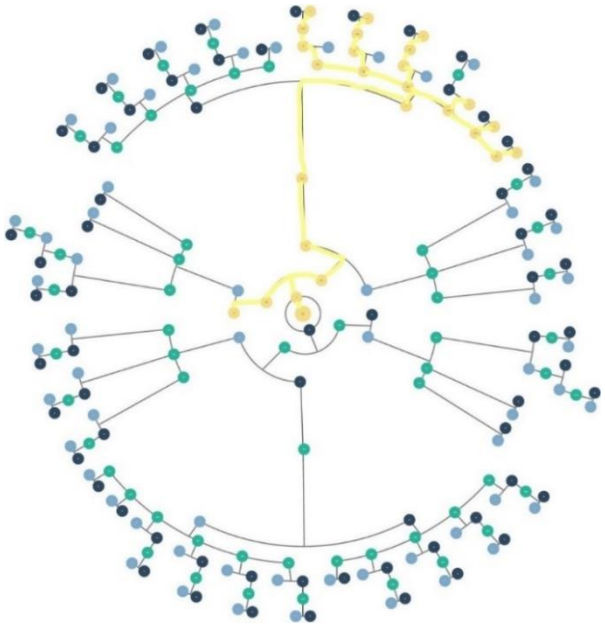

Figure 3-10: Narrative route for Type Two. A zoomable version of this image is provided in Appendix H. The yellow dots and the yellow lines mark out the route through which the generating process of the second theoretical narrative travels. The route occupies 26 dots on the map. It starts from Q1 to Q1- Y and then goes to Q2 and Q9 respectively. From Q9, it goes to Q9-N. From Q2, it goes to Q2-N-Q16-Y, and then goes to Q17-Y, Q18-Y, Q 19-Y, Q21-N-Q22-Y, Q23-N-Q24-Y, and Q25-N-Q26-Y.

The yellow row shown in figure 3-8 represent the second text type. The narrative in this text type is generated by following the yellow route marked out in figure 3-10. This text type is similar to the first one discussed above except that such a text type requires selective physical movements on the part of the ideal interpreter to reveal the hidden signs. Due to selective movement, the sequence to reveal the hidden scriptons in each momental piece of the traverse varies, but such variation is limited. In this text type, the arrangement of the scriptons in the same momental piece of the traverse is fixed. Despite the nonlinear structure of the text, the ideal interpreter can reveal all the hidden signs.

This position is suitable for books offering structurally nonlinear reading experience but without branching narrative. *Branching narrative* is a term I borrowed from game design where it originally refers to a game narrative that allows the player to experience the narrative differently each time s/he plays the game. The narrative offers more than one plot line that split off from each other at different points (Adams, 2014, p.222). Here, a branching narrative is borrowed to refer to any narrative that offers more than one plot line that split off from each other at different points, and the interpreter is only allowed to traverse one plot line at a time. In other words, in a text with branching narrative, during the interpreter's traverse, s/he is given options, and different options lead to new paths in the narrative. The paths spread out like the branches of a tree. Once the interpreter chooses one path out of its parallel paths, s/he cannot know what the other paths contain until s/he restarts from the beginning again and again to explore all the other possibilities. In texts with branching narrative, such as the reading of *Landscape Painted with Tea* (Pavić, 1992) and *Fighting Fantasy* (Livingstone and Jackson, 1982) where the narrators sometimes direct readers to turn to specific pages during their readings or throw dice to choose their own adventures, an ideal interpreter cannot reveal all the hidden signs in a complete traverse.

In this position, however, the ideal interpreter can reveal all the hidden signs. An example of such books is the one discussed before, The Unfortunates (Johnson, 1969). Although the book is loosely bound with chapters, and the ideal interpreter can read the book in whichever order s/he prefers, s/he is supposed to finish reading all the chapters. Thus, all the hidden signs will be revealed after a complete traverse. As it is a printed book, the arrangement of signs on each page (which can be seen as a momental piece of the traverse) is fixed.

Narrative apps that fit in this position are those (for example) whose scriptons (hidden or unhidden) have fixed coordinates or moving routes on the touchscreen. For example, most of the scenes in the narrative app *Spot* (2015/2015) fit in this category. *Spot* is an app belonging to the third-generation app that does not show obvious direction of the narrative flow. This app mainly relies on zoom-in function to tell stories. The app provides five different worlds or places for the interpreter to explore. Each world or place is assigned with an icon (see figure 3-11): the mould on the sandwich leads to the world of space, the piece of paper with weird signs leads to the world cats, the pencil leads to the world of robots, the cookie leads to a living room, and the picture on the newspaper leads to the world underwater.

The ideal interpreter needs to use two fingers to perform zoom-in action on an icon (a hotspot) to entre the world linking to it, and keep zooming-in to explore the chosen world. The ideal interpreter can find the five icons in all the five worlds, which gives her/him opportunities to jump to a different world. If we consider each world as a momental piece of a complete traverse, in each momental piece, the content and the positions of the scriptons remain the same as they are either designed as still images, or having the same fixed moving route when animated, like an excerpt from a film where the arrangement of the signs do not change when watched by various times.

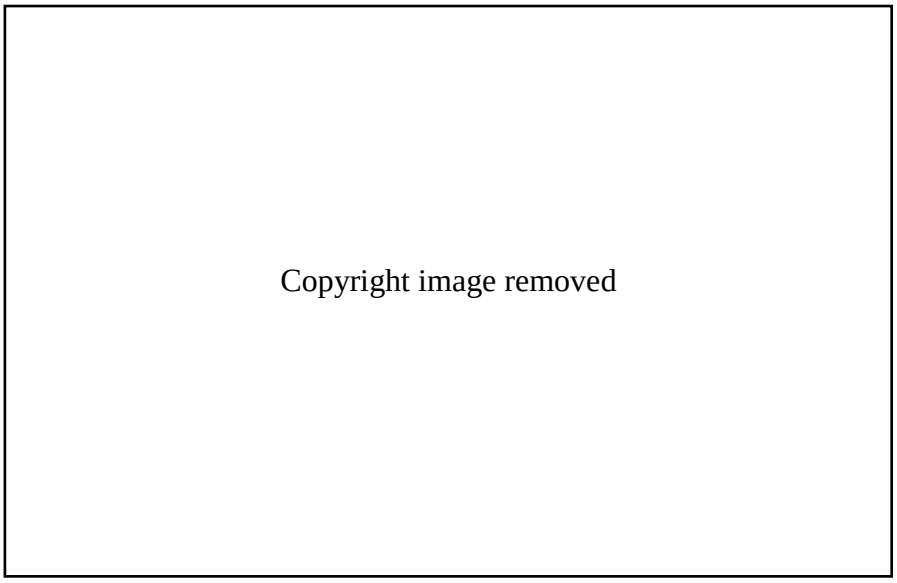

Figure 3-11: A screenshot of a scene in *Spot* (2015/2015). This scene contains all the five signs leading to five different worlds.

The sequences to reveal the hidden signs in all the momental pieces (worlds) are unfixed because the ideal interpreter can select a hotspot to activate to go to another world or simply misses some hotspots. Even within the same world, the interpreter can travel to different directions of the scene. Although the arrangement of the signs in all the scenes are fixed, which way to travel first is totally decided by the interpreter. Thus, in this app, different complete traverses of an ideal interpreter can reveal all the hidden signs, but may not reveal them in the same order.

In fact, some scenes in *Spot* also fit in type 1. Such scenes usually are designed with only one hotspot that serves as scene ‘shifter’, and that needs to be activated by zooming-in action.

Specifically, by zooming in an icon, the interpreter will not be led to the linked world immediately. S/he needs to zoom into several scenes before reaching the portal that leads to the chosen world. These scenes in between the icon and the portal are linked to each other only by the hotspot that can be used to zoom in to the next scene or zoom out to the previous scene. Thus, such hotspots can be considered equivalent to navigation buttons or hyperlinks. Travelling through these scenes is similar to turning pages in a book that has no paper engineering. Therefore, the physical actions required on the part of the ideal interpreter in these scenes are non-selective. In addition, the arrangement of signs in each of these scenes is fixed, so the part in between an icon and its portal uses the same narrative strategy seen in the examples in the first text type.

Type Three (Route Three)

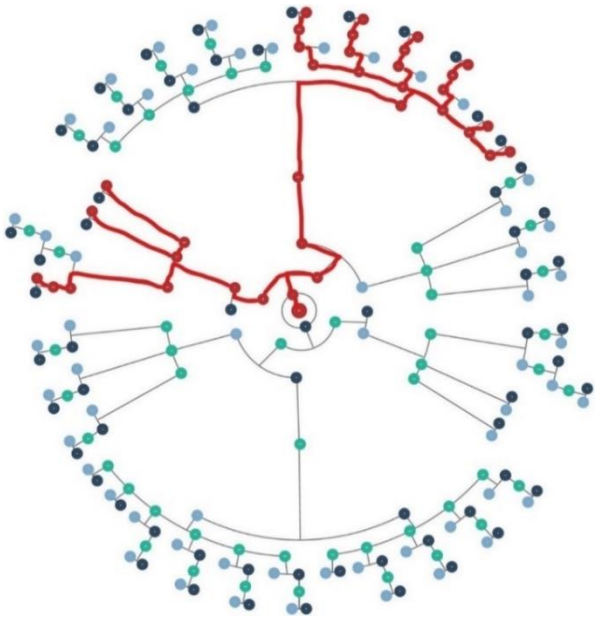

Figure 3-12: Narrative route for Type Three. A zoomable version of this image is provided in Appendix I. The red dots and red line mark out the route through which the generating process of the third theoretical narrative travels. The route occupies 36 dots on the map. It starts from Q1 to Q1-Y and then goes to Q2 and Q9 respectively. From Q9, it goes to Q9-Y that links to Q10-Y, Q11-Y and Q12-N-Q15-Y respectively. From Q2, the route goes to Q2-N-Q16-Y that links to Q17-Y, Q18-Y, Q 19-N-Q20-Y, Q21-N-Q22-Y, Q23-N-Q24-Y, and Q25-N-Q26-Y respectively.

The third theoretical text type whose position coordinate is the one shown in the red row in figure 3-8. The route to generate this type of narrative is marked out in red shown in figure 3-12. This is the type where the medium is stable, the text's mechanism requires selective movements on the part of the ideal interpreter to reveal all the hidden signs in a single complete traverse, and where the arrangement of the signs may vary during different traverses although such variation is limited. The sequence to reveal the signs in each momental piece of traverse may vary but with limited variations. In addition, the presented signs in this text type, that is, the signs that do not need to be revealed by the interpreter nor by themselves, invite physical

engagement(s) on the part of the interpreter. By physically engaging with the presented signs, the interpreter can change the arrangement of the signs, but the variation of such arrangement is limited. Moreover, the interpreter does not have to engage with the presented signs in a certain order. Although such engagement can be conducted in any order, the variation of the order is limited. One may find both print materials and digital ones suitable for this position.

An example from picturebooks is a French pop-up edition of *Le Petit Prince* (Saint-Exupéry, 2009). Apart from pop-up designs, the book also contains moveable features such as the one on page 35 where the interpreter is supposed to turn a paper turntable to form a different arrangement of stars[46]. In this page, the arrangement of signs is not stable due to the unpredictable turning style of the (ideal) interpreter. This is because there is no task assigned to the interpreter to turn the turntable in a certain way, so even for an ideal interpreter, s/he can turn it in whatever way s/he prefers. Thus, each turn, if differs from the previous one(s), will generate a different content of the scripton (the turntable). However, the area of the turntable is limited and the signs printed on the turntable is limited too, and therefore the variation of the arrangement of signs on this page is limited.

Another similar example is the pop-up book *Peter Pan* (Barrie, 2015) illustrated by Minalima, where, for example, on pages 79 and 151, the interpreter is encouraged to move the unfixed features on the pages to form new patterns of signs. Like *Le Petit Prince* (Saint-Exupéry, 2009), the arrangement of signs as well as the sequence to reveal the hidden signs on each of these pages (one momental piece of the traverse) may not be the same during different traverses. Additionally, as the choices for moving the unfixed features are limited, the variation of the arrangement of the signs and the sequence to reveal the signs on the pages is limited.

There are many narrative apps fit in this position. This kind of the narrative app usually contains signs (hidden or unhidden) that are programmed with more than one coordinate on the

[46] It is arguable whether this turntable can be considered as both being relevant to question 9 that enquires about the condition of the engagement between the *presented* signs and the interpreter, and to question 16 that enquires about the relationship between the *unpresented* signs and the interpreter, as the turntable itself *is* presented to the reader and invites the interpreter to turn it around, but by turning the turntable, the interpreter also reveals signs from the turntable that is not presented previously. This concern also applies to narrative apps with hotspots as the hotspots areas are visible to the interpreter, but by tapping on them, most of the time, new signs will be revealed.

touchscreen, so the signs can travel through many different routes during different traverses of the interpreter. Such apps usually have more than one hotspot programmed to a scene so the interpreter can decide the order to activate them. The apps also require an ideal interpreter to traverse all the scenes to have a complete version of the story. Therefore, it is possible for the ideal interpreter to reveal all the hidden signs in a complete traverse, but may reveal them in different order with different arrangements of the signs.

For example, in the app *Lil'Red* (2012/2013), a second-generation app, there is a scene (NS2) where the little girl comes to the woods (see figure 3-13). There are four bunches of flowers in this scene. One can choose a bunch to tap on, which is a physical engagement between the interpreter and the presented signs, and the girl will go to that bunch to pick a flower from there. As the interpreter's action is selective, so the sequence of all the flowers being picked is not fixed. The arrangement of the signs thus varies too. Considering that there is a limited number of flowers to choose from, the variation of the sequence and the arrangement are both limited. Although the app is programmed with many engaging elements for the interpreter, an ideal interpreter can reveal all the hidden signs in a complete traverse.

Figure 3-13 A screenshot of NS2 in *Lil' Red* (2012/2013).

Type Four (Route Four)

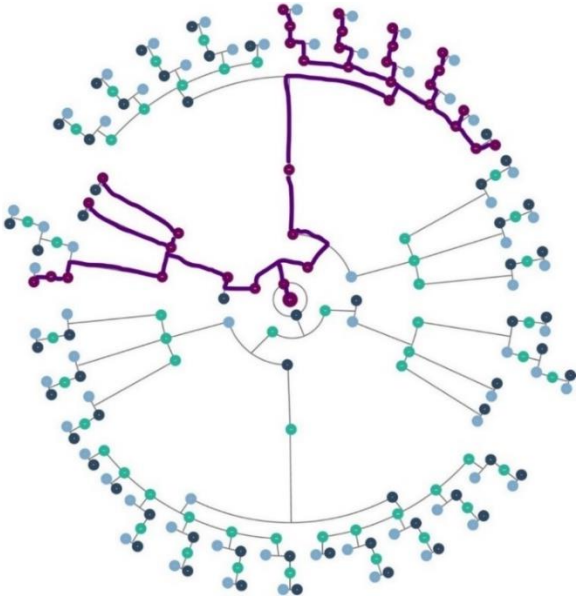

Figure 3-14: Narrative route for Type Four. A zoomable version of this image is provided in Appendix J. The purple dots and purple line mark out the route through which the generating process of the fourth theoretical narrative travels. The route also occupies 36 dots on the map. It starts from Q1 to Q1-Y and then goes to Q2 and Q9 respectively. From Q9, it goes to Q9-Y that links to Q10-Y, Q11-Y and Q12-N-Q15-N. From Q2, the route goes to Q2-N-Q16-Y that links to Q17-Y, Q18-N, Q 19-N-Q20-N, Q21-N-Q22-N, Q23-N-Q24-N, and Q25-N-Q26-N respectively.

The purple row in figure 3-8 shows the fourth type of texts to be demonstrated. The narrative of this type travels through the purple route marked out in figure 3-14. This type of texts is similar to the third type except that firstly, the interpreter cannot reveal all the hidden signs during a complete traverse, and secondly, the variations of the arrangement of the signs and the sequence to reveal the signs in each momental piece of the traverse or in different complete traverses may be unlimited.

Empirical examples of this type are usually found in adventure computer games that contain branching narratives where the interpreter must choose one option to continue. As introduced before, branching narratives prevent an ideal interpreter exploring all the possibilities of the narrative unless s/he starts from the beginning again and chooses a different option until s/he exhausts all the possibilities. As for the arrangement of the revealed signs in a momental piece of the traverse, it may not remain the same during different traverses because the signs may be programmed with more than one coordinate or moving route on the screen. In computer games, however, the variation of the arrangement of the signs may be limited or may not, which is dependent on the design of the game. For example, if the game allows random unlimited player input, the variation will be unlimited. The condition of the sequence to reveal the hidden signs in computer games is mostly the same as the one discussed in *Lil' Red* (2012/2013), except the situations where unlimited player input is allowed, and in such cases, the variation of the

sequence to reveal hidden signs is unlimited.

Many narrative apps adopted the narrative strategies used in computer games. For example, besides the one discussed previously, *The Ogress* (2012/2012), the following apps also contain branching narratives: *Jack and the Beanstalk* (2014/2017), *Little Red Riding Hood* (2013/2017), *Wuwu & Co.*(2014/2017), and *The Great Ghost Chase* (2014/2014). Some apps, although do not have branching narratives, allow unlimited interpreter input, such as the scene in *The Poppin Princess* (2013/2013) shown in figure 3-2.

Conclusions and Implications

This chapter started with two questions:

1. What are the basic elements of storytelling?

2. Has the narrative app brought any element essentially distinctive from the basic elements of storytelling?

The First Question

I have explored the first question by constructing a storytelling mechanism that contains three necessities, namely, *the narrative content*, *the medium* and *the interpreter*. These elements influence and are influenced by each other during the construction of a narrative. In other words, a narrative text appears to be a collective production. It is a result of collaborative efforts involved in the relationship among all the three elements. In this collaboration, the nature of the medium seems to play a crucial role in the way that the narrative content can be arranged and perceived. This perception has led to an investigation of the relationship between the medium and the textual behaviours.

The investigation began with the medium, but departed from the medium as it turned out that the discussion of MTBs can be independent of the medium, which gave rise to an original typology of narrative texts that constitutes a crucial part of the storytelling mechanism theory. This storytelling mechanism theory was built on cybertext theory, but is different from it in many ways.

By comparing the two theories, this chapter has clarified the position of the storytelling mechanism theory in relation to its theoretical origin. It has posited that both theories take a media-inclusive scope that does not prioritise any particular medium, but the storytelling mechanism theory may have a broader view than cybertextual perspective as the former considers signs of all types while the latter only deals with verbal signs.

Most importantly, the methodology developed in the storytelling mechanism theory appears to be more logical than that of cybertext theory's in exploring the mechanical production of a narrative. The former balances the investigation by looking at both individual behaviours of each element and their mutual influence on each other, while the latter appears to overlook these factors. As a result, a considerable number of theoretical text types provided by cybertext theory seem to overlap one another, which, according to this study, may weaken its explanatory, analytical and heuristic power. The storytelling mechanism theory, on the other hand, uses a series of 35 logical (sequential) questions to enquire about a narrative text and thus seems to have avoided the problem of repetitive text types. In this way, the storytelling mechanism theory may reflect a relatively more rigorous picture of the working principles of storytelling.

The visualisation of the logical/sequential relations among the 35 questions in figure 3-6 helps one to make sense of the rationale for the 35 criteria. The theoretical route map of the storytelling mechanism theory shown in figure 3-7 is useful in visualising two aspects of a narrative production: the first one is the level of the complexity of the mechanism of a narrative text, which can be perceived from the actual number of dots occupied by a particular text – the more dots occupied, the more complicated the textual machine is; the other one is the process or the sequential steps of a narrative being produced, which starts from the biggest dot in the middle and afterwards travels through dots and lines to the outer circles.

Having said that, the storytelling mechanism theory is meant to be a broad perspective to study textual and media behaviours, but it is not intended to be the only way to look at a text or a medium. It is certainly not meant to invalidate other theoretical approaches.

The Second Question

Under the lens of the storytelling mechanism theory, it appears that the narrative apps accessed by this study do not seem to display any unique MTB. All the manifest behaviours are

evident in some other literary media. Thus, it appears that the narrative app has not brought any essential change to the mechanical layer of the storytelling mechanism, although it may have shown more complicated narrative patterns. However, this conclusion by no means suggests that the traversal experiences of the interpreter will be the same, as a multimodal approach may demonstrate how different these experiences may be.

With the visual aid of the theoretical route map (figure 3-7), this study has found that *Spot* (2015/2015), being a Third-Generation app, occupies 26 dots on the theoretical route map, while *Lil' Red* (2012/2013), a Second-Generation app, occupies 36 dots on the map. This seems to suggest that a narrative app belonging to a later generation does not necessarily display more complicated MTBs than its predecessors.

The findings may also suggest that different generations of narrative apps do not necessarily manifest different narrative quality or aesthetic value. In other words, the narrative quality and the aesthetics of a literary text does not seem to be relevant to the complexity of its textual mechanism. However, this is not to suggest that they should not or cannot be connected. On the contrary, this study suggests that the mechanical strategies of a literary production should be used as devices to complement storytelling. The creation of a literary text should also take advantage of possible mechanical strategies. This indicates that the interpretative layer of the storytelling mechanism requires equal attention, and this layer should be explored along with the mechanical layer as the two have mutual influence on each other.

Thus, it seems that merely exploring the mechanical layer of the storytelling mechanism may not be sufficient to develop a thorough understanding of how the narrative app works. Therefore, in the next chapter, I will continue the investigation of the construction of narrative in the narrative app by exploring the interpretative layer of the storytelling mechanism in connection with the mechanical layer.

Chapter Four: The Storytelling Mechanism II: The Interpretative Layer

> *[It] is not the computational function of the link that constitutes the literary value – the link is just a device.*
>
> (Luesebrink, 2001)[47]

Introduction

In the previous chapter, in the light of cybertext theory, this study developed a new theory to study the narrative app, namely, the storytelling mechanism theory. It was argued that the storytelling mechanism is composed of two interrelated layers, the *mechanical layer* in relation to the arrangement of signs, and the *interpretative layer* in relation to meaning and meaning-making. Chapter Three was devoted to study the mechanical layer, while this chapter will be used to investigate the interpretative layer.

Considering meaning and meaning-making are broad concepts, this study narrowed the inquiry down to one aspect of meaning and meaning-making, that is, the construction of narrative, or the narrative structure in narrative apps. This study examined the *narrative structure* or the *structure of a narrative* from two perspectives: the *semantic structure of the narrative content*, i.e. how each basic narrative unit is connected to each other semantically, and the *physical structure of a narrative text*, i.e. how a text can be traversed by the interpreter physically, or in other words, the traversal routes in a text that are made possible by the design of the mechanics of the text. The reasons to study the narrative structure of narrative apps are as follows.

The physical narrative structure of a text is related to presentation, while semantic narrative structure is related to both presentation and perception. Chapter Three has argued that what can be perceived is influenced by what is presented (even though sometimes what is presented might not be perceived by the interpreter), and what is presented is affected by the mechanics of the

[47] This article was published in *Electronic Book Review* that does not provide page numbers for its publications.

text. In other words, the mechanics of the text directly influence the presentation of the narrative content which directly affects the interpreter's perception of the text. Thus, understanding textual presentation appears to be a crucial step towards understanding textual meaning. This chapter proposes to study textual presentation by studying the relationship between the textual mechanics and the narrative structure.

In order to understand how narrative apps tell stories, this chapter proposes to use (some of) the 35 typological questions developed in Chapter Three to examine the relationship between the mechanics of narrative apps and the narrative outcome. In other words, this chapter aims to study how three relationships influence the structure of the narrative in narrative apps. These three relationships are those between the interpreter and the narrative content, between the narrative content and the medium, and between the medium and the interpreter. In addition, considering a narrative app has a stable medium which is a touchscreen, this chapter will *only* discuss circumstances where the medium is stable.

The Method

There are many theoretical approaches available to study the narrative structure of a text, including narratology, literary critical theories, multimodality, cybertext theory, and game studies. These approaches are all valid and effective in their own ways, but this research chose to use the 35 typological questions (which were developed based on cybertext theory) to approach narrative apps with some concepts adopted from narratology and video game design scholarship. The reasons are as follows.

The Research Interest

The interest of this research is three-fold in terms of exploring the communication among the interpreter, the medium and the narrative content in the narrative app. Firstly, it enquires about the ways that the two layers of the storytelling mechanism influence each other. Secondly, it enquires about relational impacts that the interpreter, the medium and the narrative content have on each other and on the whole mechanism in producing a narrative (in a narrative app). Thirdly, it enquires about the relationship between the mechanics of the storytelling mechanism and the structure of the narrative outcome.

In other words, this study is not interested in the textual meaning (e.g. how to interpret a text via various modes or semiotic resources), but in how the text's mechanics influence its narrative structure and its narrative quality. In this sense, both the mechanical and the interpretative layers of the storytelling mechanism under investigation can be regarded as pre-interpretation stage. From this perspective, none of the methodologies commonly used in literary critical theories or multimodality appear to be suitable for this research.

Specifically, the methods used in various literary critical theories usually focus on interpretation of the narrative content, which may not be immediately irrelevant to this study. Multimodal methods are usually used to approach the structure of a narrative, but not in a way that is intended in this study. Precisely, according to Jewitt et al. (2016), any approach in multimodality studies seems to be based on three key premises:

1. Meaning is made with different semiotic resources, each offering distinct potentialities and limitations.
2. Meaning making involves the production of multimodal wholes.
3. If we want to study meaning, we need to attend all semiotic resources being used to make a complete whole. (p.3)

These three premises suggest that when using multimodality to do structural analysis of a text, the approach enquires about the construction of meaning, not the construction of the textual mechanics. Frederico (2016) makes this point clear in her multimodal study of narrative apps:

> In the structural analysis of the story [i.e. narrative], it is necessary to go beyond the description of the different modes and their denotative meanings and question how these modes create these representations, how they interact in the construction of the multimodal narrative and what are their potential for connotative meanings. (p.131)

The interest of this research lies in understanding the textual mechanics, which is prior to meaning-making. This is not to say that multimodality and the theory of storytelling mechanism are not compatible. On the contrary, multimodal perspectives may help develop an even more complex and systematic theory of the storytelling mechanism, as multimodality aims to exhaust all semiotic resources used in the meaning-making process. This means, a developed storytelling mechanism theory reflecting multimodal perspective will break down the interpreter, the medium and the narrative content respectively into various micro basic semiotic units. However, such a grand project is beyond the limit of this research, but may be the interest of the future

research.

Besides different objectives, this study and multimodality studies seem to have different focuses when studying a narrative. Multimodal methods appear to study three relationships that affect meaning-making. They are the relationships between the sign producer (e.g. authors, photographers, illustrators, directors) and the sign receiver (the interpreter), between the sign receiver and the sign (the materialised narrative content), and between signs respectively (e.g. Kress & Van Leeuwen, 1996). This research, as introduced in Chapter Three, considered relationships between the narrative content and the medium, between the medium and the interpreter, and between the interpreter and the narrative content. This research was not meant to study the relationship that exists in between narrative content, nor was it concerned about sign producers when they were not *directly and physically* involved in the mechanical production of the narrative in the actual moment of storytelling. When they were, they were examined as either the *interpreter* or the *unstable media*.

To be specific, 'sign producer' may be understood in two ways. The first way can be considering the original narrative creator, such as an author of a book, as the sign producer. The second way may be considering everyone involved in the story telling and receiving as sign producers, such as readers and players besides authors.

In the first case where the sign producer is the original narrative creator, if the sign producer creates signs for stable media, s/he is not present in the instant of communication among the interpreter, the medium and the narrative content, while the storytelling mechanism theory was developed to enquire about the *instant communication*.

Specifically, in the situation where signs are presented in stable media, the sign producer plays a role more like a programmer who designs the programme, predicts possibilities of the communication outcome between the interpreter and the programme, but cannot be physically involved in all the actual communications after the programme is installed to various personal computers. For example, when a child is engaging with a narrative app, the instant participants in this app exploration are the child, the app and the tablet computer. There is no doubt that the app producers have crucial influence on the narrative development as it is they who create the core storyline, but during the actual production of the narrative, the sign producer cannot offer

instant feedback to the child, or affect the actual narrative development in any direct way. What responds to the child, and what the child responds to are the application software and the touchscreen. The same is true of a reader reading a book where the instant communication between the reader and the author is absent, and of audience watching a film where the instant communication between the audience and the director and other staff who were involved in the film production is absent.

When the sign producer is physically present in the storytelling mechanism, this situation is usually seen in the texts with unstable media, such as in oral storytelling where the sign producer is the storyteller. In this case, as explained in Chapter Three, the oral storyteller is considered as an unstable medium that presents the narrative content to the audience.

In the second case where everyone involved in the storytelling are considered as sign producers (for example, when a child is physically engaging with a narrative app, by touching hotspots to generate some new narrative content, the child can be regarded as 'producing' signs for the storytelling), these participants are studied specifically as the *interpreter*.

While literary critical theories and multimodality studies do not seem to be suitable to meet the goal of this study, scholarship in narratology and video game design appear to be useful to approaching the narrative structure of narrative apps.

Narratology & Semantic Narrative Structure

In narratology, structural analysis of the narrative (i.e. the materialised narrative content) breaks the narrative down into different small narrative units. Based on the functional character of the units, Barthes and Duisit (1975) categorise these narrative units into *nuclei* and *catalyses*.

Nuclei are 'consecutive and consequential' events, chronologically and logically linked, 'directly affecting the continuation of the story [i.e. fabula]', so they are related to fabula (what happened). *Catalyses*, on the other hand, are 'subsidiary notations, which cluster around one nucleus or another' but they do not modify the nature of the nucleus. They are 'no more than consecutive units', 'purely chronological', associated with discourse (how the fabula is told). A catalysis 'precipitates, delays, or quickens the pace of discourse, sums up, anticipates, and sometimes even confuses the reader' (Barthes & Duisit, 1975, p.248-249).

Barthes and Duisit (1975) give an example to help differentiate *nuclei* from *catalyses*. They offer a segment of narrative that reads 'the telephone rang […] Bond made his way to the desk, picked up the phone, put down his cigarette' (p.248). The theorists argue that when the telephone rang, 'it is equally possible to answer or not answer the call, procedures that are bound to carry the story [fabula] along different paths' (p.248). Therefore, the narrative units that affect the continuation of the fabula are 'the telephone rang' and 'Bond picked up the phone', which are *nuclei*. The descriptions filled in between and after the *nuclei* are *catalyses* as their function is to bring subsidiary notations to the fabula. Barthes and Duisit (1975) later summarise that 'one cannot delete a nucleus without altering the story [fabula], but then again one cannot delete a catalysis without altering the discourse' (p.249). This seems to suggest that if two narratives share the same fabula, they must have same nuclei (which may not be arranged in the same order[48]), but not necessarily the same discourse because catalyses are optional. If two narratives share the same discourse, it means that they contain same catalyses (which may not be arranged in the same order), but not necessarily the same fabula because, for example, one narrative may have more nuclei than the other while these nuclei are not accompanied by catalyses, or two different nuclei in the two narratives may be accompanied by the same catalyses.

Barthes and Duisit's (1975) discussion of *nuclei* and *catalyses* is based on the content or the meaning of a narrative unit. Although their research is titled 'the structural analysis of narrative', their focus is in fact on the semantic structure of the narrative content, not the physical structure or the shape of the text. However, in his aesthetical inquiry of the narrative app *Lessmore* (2011/2015), Schwebs (2014) appears to be the first to use *nuclei* and *catalyses* to address the *physical structure* of the app. He explains that the 'nuclei constitute the narrative backbone', which are represented by the 27 sequential scenes in the app, while catalyses, as 'optional narrative units', are 'expansions' of the narrative, appearing as 'animation events' (i.e. hotspots) in the app to add mood, for example, and atmosphere to the fabula (p.6). Schwebs (2014) further argues:

[48] According to Barthes and Duisit (1975), nuclei are logical and chronological events, but this does not mean that they must be put back in the actual storytelling in a logical and chronological order. A novel can be written in a flashback manner. The nuclei of this novel are core events that are rearranged in a logical and chronological order. The same is true with catalyses that are chronological optional events to expand on the fabula. They do not need to appear in a chronological way in the actual storytelling, so two narratives sharing the same discourse do not need to have their catalyses arranged in the same order.

> In order to read the Lessmore story and to gain access to the animation events, the reader needs to visit all the scenes [… i.e. nuclei] in the prearranged order, but he does not have to execute the animation events [… i.e. catalyses]. However, by neglecting them, he misses one of the fundamental affordances of the app aesthetics. (p.6)

Narrative scenes and hotspots are closely related to the question of how a narrative app allows its interpreter to traverse, i.e. they are designed to appear physically in certain sections of the narrative, although the arrangement of such physical structure is determined by the meaning and functions of the narrative units. Schwebs' (2014) approach nevertheless reflects the important influence the physical structure of a text has on the narrative outcome. Although Schwebs does not investigate further on such influence, it can be inferred that by activating hotspots selectively or in a different order, the interpreter can change the sequence of the *catalyses*. If a narrative app provides optional scenes for optional endings, by selecting different scenes to get different endings, the interpreter changes the nuclei too. Either or both alterations of narrative units will affect the narrative structure, both physically and semantically, which may consequently affect the perception of the text. It seems that this 'freedom' of organising *nuclei* and *catalyses* physically can only be possibly realised by designing the physical structure of the text[49] in certain ways.

This being said, Schwebs' (2014) method of applying narratological concepts to analysing a narrative app does not seem to be without problems. According to Barthes and Duisit (1975), a nucleus and a catalysis are both basic/minimum narrative units, two individuals linked by a certain connection. This is to say that a nucleus may be accompanied by catalyses, but it does not contain them. Therefore, if we regard the 27 narrative scenes in *Lessmore* (2011/2015) as *nuclei*, from a narratological perspective, we seem to suggest that each narrative scene including everything appearing on the scene before and perhaps after[50] any hotspot being triggered is, firstly, a minimum narrative unit of the narrative, and secondly, in the words of Barthes and Duisit (1975), 'opens (or maintains or closes) an alternative directly affecting the continuation of the story [fabula]'(p.248), just like answering or not answering the phone call. However, it

[49] It is necessary to point out that such a structural design of the text is not exclusive to narrative apps. As discussed in the previous chapter, print books can also use their physical structure to influence the narrative outcome, such as the novel *The Unfortunates* (Johnson, 1969) whose unbound chapters give the interpreter freedom to arrange the chapters in any physical order, and thus traverse the novel in different routes, which consequently changes the order of some *nuclei* and *catalyses* in the book.

[50] In this thesis, different from Schwebs (2014) who separates hotspots from scenes, hotspots are considered as part of a scene in a narrative app, not independent of a scene. Therefore, the premise of any discussion of an NS in this thesis considers the narrative content presented both before and after the physical engagement by an interpreter.

seems that, on the one hand, not all these scenes portraying consequential events in *Lessmore* (2011/2015) but only consequential events qualify as *nuclei*. On the other hand, all of these scenes contain catalyses even before the 'animation events' are activated, which means that it might not be suitable to consider the 27 scenes in *Lessmore* (2011/2015) as *nuclei*.

For example, without considering the animated or unanimated images in the app, just by examining the words presented to the interpreter before s/he triggers any hotspot, one may find that every NS contains catalyses. For example, in the first four NSs, the words in NS1 do not seem to contain any nuclei because among the five sentences shown on the bottom of NS1 (see figure 4-1), it is arguable that none of them depict logical and chronological cause for the beginning of the fabula in this storytelling.

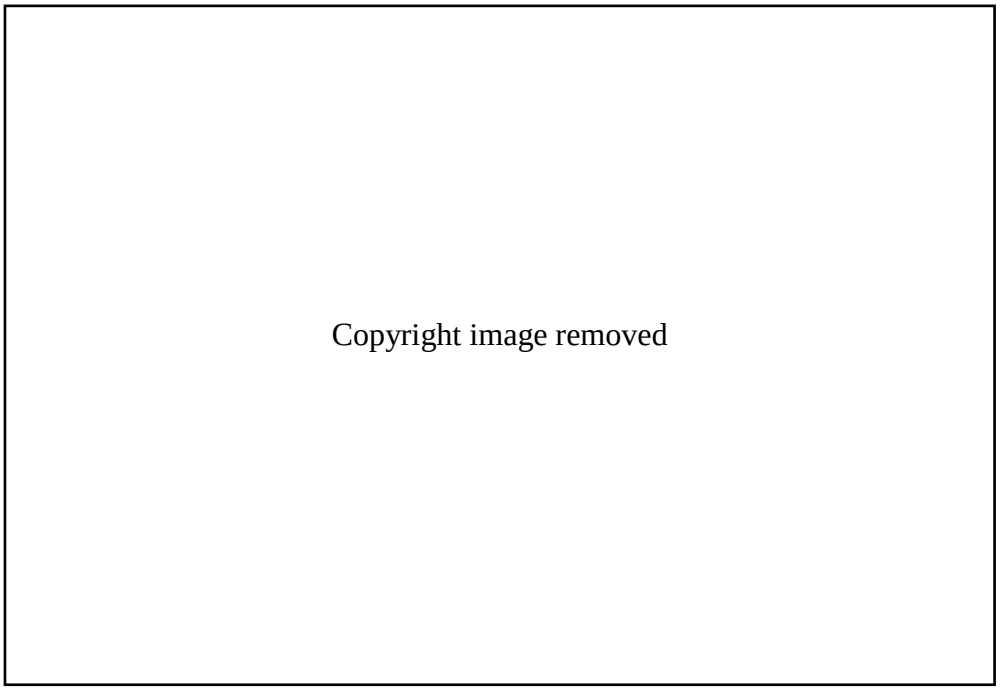

Figure 4-1: A screenshot of NS1 of *Lessmore* (2011/2015).

The fabula of *Lessmore* (2011/2015) can be summarised as: This is a story about Lessmore's adventure after being blown away by strong winds. However, logically, the five sentences in NS1 are not the cause of the strong wind, nor are they the cause of Lessmore's adventure. As for NS2 to NS4 (see figures 4-2, 4-3 and 4-4), it is arguable that each of them contain a nucleus that is accompanied by catalyses. These nuclei are: 'One day the sky darkened […]' (NS2), 'the

wind blew […]' (NS3), 'till everything […] was scattered' (NS4). The darkened sky opens a possibility for strong winds, and wind blowing leads to things being scattered. The rest of the words before or after these nuclei may be read as catalyses that are expansions of the fabula.

If we examine the images along with words, NS1 may contain a nucleus but this nucleus must be revealed by the interpreter. In this scene (see figure 4-1), there are two white arrows in the centre of the screen fading in and out. These white arrows are indicators that suggest the interpreter swipe the screen towards the direction indicated by the arrows. If the interpreter does accordingly, s/he will trigger the wind that blows Lessmore and his books away. As argued previously, the strong wind can be seen as the main cause of Lessmore's adventure, and therefore, this piece of hidden narrative content can be regarded as a nucleus of the narrative. Thus, contradictory to Schwebs' argument that the interpreter 'does not have to execute the animation events' as they are catalyses, this piece of animation seems to be a nucleus that needs to be executed.

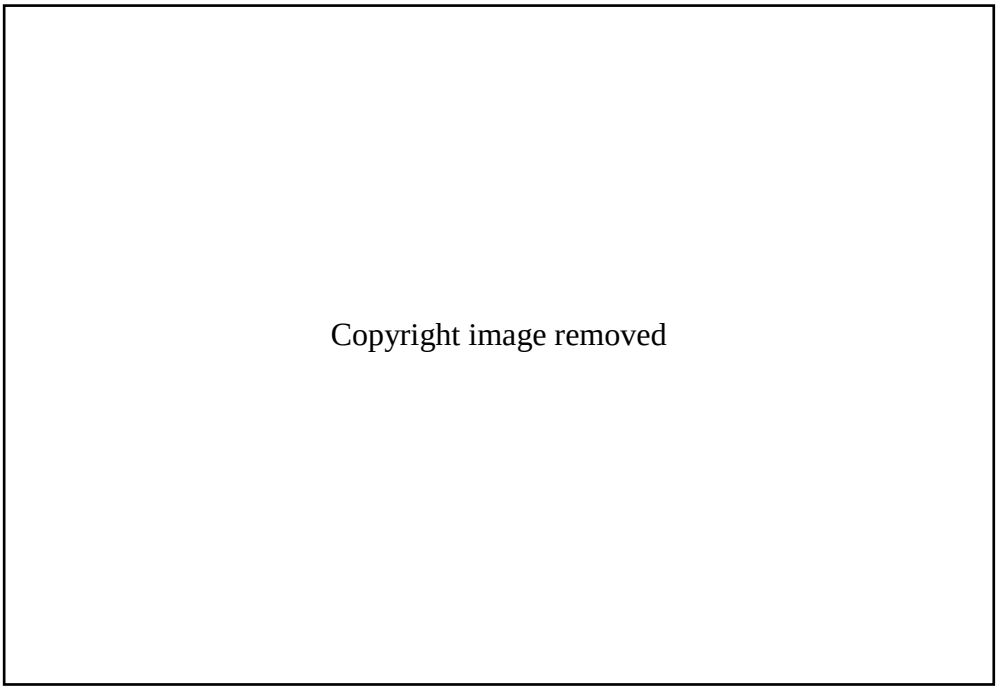

Figure 4-2: A screenshot of NS2 of *Lessm*ore (2011/2015).

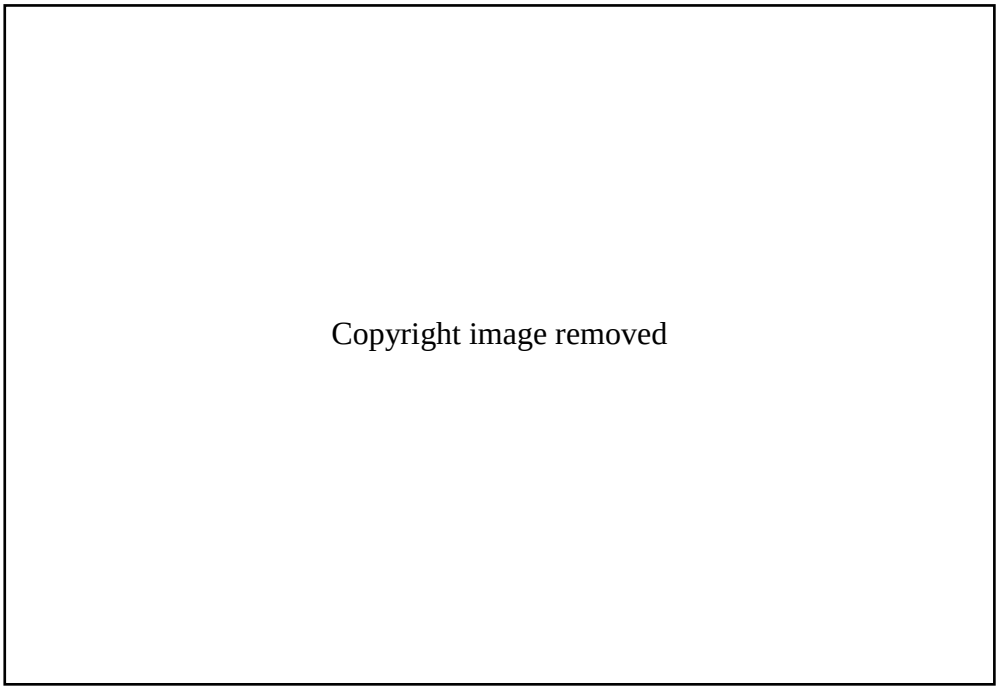

Figure 4-3: A screenshot of NS3 of *Lessmore* (2011/2015).

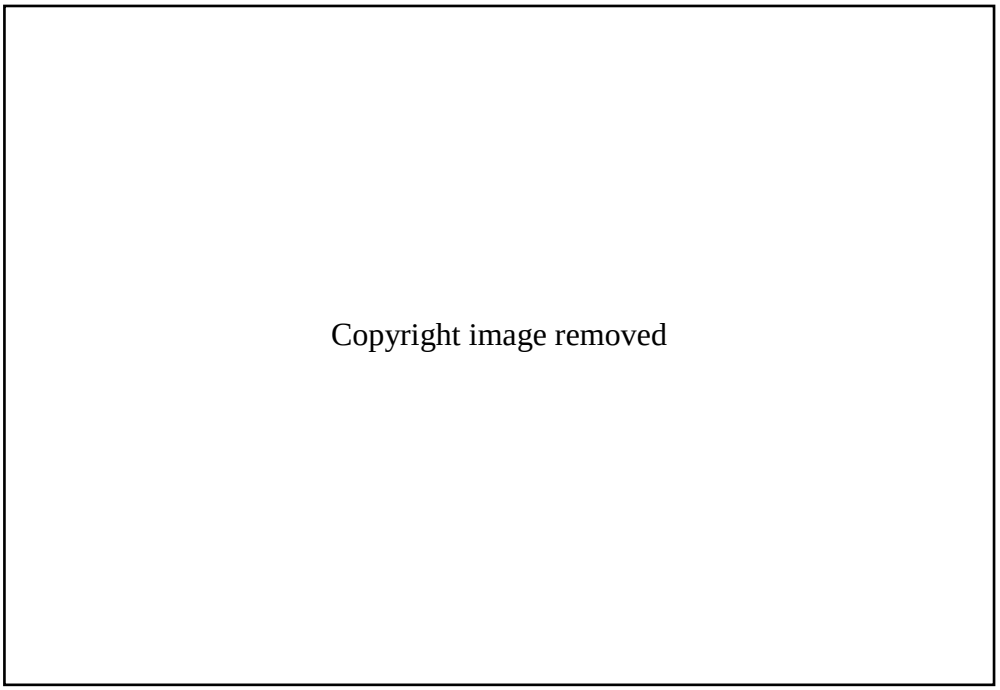

Figure 4-4: A screenshot of NS3 of *Lessmore* (2011/2015).

This brief analysis of using *nuclei* and *catalyses* to study *Lessmore* (2011/2015) shows that, although narratological concepts are useful in understanding the narrative aspect of a narrative

app, they might not be immediately effective to study the physical narrative structure because these concepts were established for content analysis, while a narrative app's narrativity relies both on its narrative content and its physical narrative structure[51].

Video Game Design & Physical Narrative Structure

To approach the physical narrative structure of a narrative app, it is perhaps helpful to turn away from narratology to video game design as the former focuses more on the content while the latter, by comparison, focuses more on the design of the physical structure[52].

According to Adams (2014), '[f]rom the earliest days of computer gaming, designers have been intrigued by the idea of agency: letting the player influence the plot and change the outcome' (p.221). Thus, for a video game designer, if the future events and the direction of a game cannot be changed by a player, this game is considered to have a *linear narrative*[53], while the game that allows the player to influence its development such as plots and/or endings are regarded as having *nonlinear narrative*[54] (Adams, 2014, p.221).

Generally speaking, there are two ways to create a nonlinear structure for a game according to Adams (2014). The first way is to write more than one optional narrative unit for various stages in the gameplay for the player to choose from. The second way is to use AI technology to create emergent narrative.

In terms of the first way, there are basically two types of nonlinear structures, namely *branching narrative* (figure 4-5), which has been introduced in Chapter Three, and *foldback narrative* (figure 4-6). Both narratives contain various nodes (i.e. branching points) leading to various branches in the narratives.

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[51] Although the narrativity of some non-digital literature also relies heavily on the design of their physical narrative structure, such as the examples given in Chapter Three, the degree of this dependence does not seem to be as much as required by digital literature whose narrative is largely based on the design of digital links or nodes in the texts.

[52] This statement by no means indicates that video game design does not care about the content of the game, nor to suggest that structural design is not important for books.

[53] Chapter Three has discussed that the concepts of *linear* and *nonlinear* in game studies address the structure or the shape of the text, not the textual content, although with the change of textual structure, the narrative content will be altered too.

[54] The original text refers two situations as 'linear stories' and 'nonlinear stories'. The concept of *story* here loosely refers to 'an account of a series of events, either historical or fictitious' (Adams, 2014, p. 211), which is similar to the concept of *narrative* in narratology. Therefore, I replaced 'story' with 'narrative', for the sake of consistency.

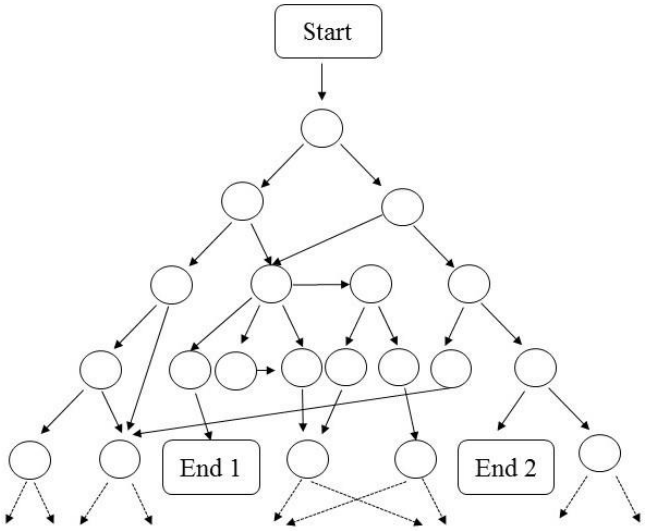

Figure 4-5: A simplified structure of a branching narrative based on Adams' (2014) visual example (p.224). Each circle represents a branch of the narrative containing some narrative content. In every branch, the player is given options to choose from. One option of a branch can lead to anywhere in the narrative structure, not necessarily to the next level as shown in the figure. In a branching narrative, there are more than one endings written in the game script, and the player's choices decide which ending s/he will reach. The dotted lines reaching out from the bottom level represent the possibilities of more branches and endings should the game designer wishes to write.

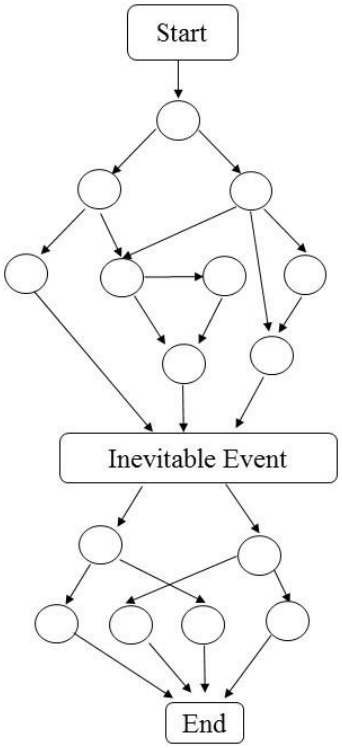

Figure 4-6: A simplified structure of a foldback narrative based on Adams' (2014) visual example (p.226). Each circle represents a branch of the narrative. To some point, all the branches of the narrative must lead to an 'inevitable event'. Such an event can be as many as possible in a game play, and the last inevitable event ends the narrative.

The differences between the two narratives are, firstly, a branching narrative does not contain an event that all possible traversal routes must come across, while a foldback narrative contains *inevitable events* which all traversal options must lead to. Secondly, a branching narrative has multiple endings dependent on the choices of the player while a foldback narrative only has one ending, so in a foldback narrative, the game will always be ended in the same way no matter how differently a player has traversed in between the starting point and the end. Based on figures 4-5 and 4-6, it can be inferred that the more changes a player is allowed to make in a gameplay, the more complicated the text's physical structure has to be.

From a narratological perspective, every node in a branching or foldback narrative can be considered as either a nucleus (which may or may not accompanied with catalyses) or a group of catalyses. It is necessary to point out that nuclei are crucial to the fabula development but different nuclei (or different fabula) may not lead to different endings of the narrative. In other words, the same result may have different causes. For example, assume that we need to tell a story that should be ended with 'the world was saved'. To reach this end, we can create many different narratives consisting of different nuclei. This suggests that both a branching narrative (with different endings) and a foldback narrative (with only one ending) are capable of providing different nuclei to the interpreter. It can also be inferred that if the interpreter ends up with the same ending of the narrative in different traverses, s/he might not necessarily have picked the same nodes that offer her/him same nuclei in all these traverses. However, if the interpreter finishes different traverses with different endings, s/he must have picked different nodes as well as having experienced different nuclei.

In video game design, there is a concept that can be used to describe this relation between the interpreter's action and the narrative outcome, namely *dramatic action*. According to Adams (2014), if the player takes an action that 'changes the direction of the plot line and, thus, future events in the story [i.e. narrative] as the player will experience it', such an action is a *dramatic action* (p.507). Adams (2014) specifically notes that '[m]any player actions contribute to a story [i.e. narrative] but are not dramatic actions; they do not change the future' (p.507). This may be understood as when the interpreter chooses a node that contains a nucleus which is decisive in terms of how the narrative may end, this action of the interpreter is a dramatic action. If the interpreter chooses a node that contains catalyses, or a node that contains a nucleus which is not a decisive factor for how the narrative may end, this action is not dramatic action. Thus, it seems

that only a text having a branching narrative structure can afford dramatic action.

Intrinsically, a branching narrative and a foldback narrative still control the direction and the development of the narrative as all the narrative units in such storytelling are pre-written. In contrast, there is another way of designing nonlinear narrative structure, namely emergent narrative, that gives much more freedom and power to the players.

Emergent narrative, a concept introduced by video game designer Marc LeBlanc (2000), refers to the narrative that entirely emerges from the communication between the players and the systems that govern the gameplay. There is no pre-written plot or narrative structure in an emergent narrative, i.e. there are no branches for the player to choose from nor linear structure to follow. (e.g. Adams, 2014; Dinicola, 2013; Gronseth, 2015; LeBlanc, 2000). In other words, in games that allow emergent narrative, the game designers only design a basic game environment and AI characters (game characters based on artificial intelligence) that can react to the human player like a real human being. The designers do not write stories in an emergent narrative. The so-called stories emerge from personal engagement of the player with the AI characters in the gameplay.

For example, the award winning game Façade (Mateas and Stern, 2005) is an AI-based interactive game that features three characters, a couple who are experiencing marital crisis and a close friend of the couple's who will be played by the player. The game setting is surrounding a gathering between the friend and the couple in the couple's apartment. The whole game features the friend's perspective. It starts with the husband opening the door to the friend (the player). The player can type anything to 'speak' with the couple, and the couple, as AI characters, will respond spontaneously to the player. Depending on the player's input, s/he may help the couple to survive the crisis, speed up their break-up, or even be thrown out of the apartment. Thus, in Adams' (2014) words, 'in principle, anything can happen at any time [in an emergent narrative] so long as the core mechanics permit it' (p.228). From this perspective, as Gronseth (2015) comments, an emergent narrative is personal and instant, as it only happens during the specific moment of the game play between specific players and the specific programme feedback. If the player decides to play the game for another time, or another player wants to play the game, they are likely to create different emergent narratives as the communication or the players' actions are unplanned.

According to Adams (2014), emergent narrative is still ‘an experimental technique’ in game design (p.228). In narrative apps accessed by this study, there are no emergent narrative cases found so far, but some narrative app developers, such as those in Nosy Crow (a British company) and Step in Books (a Danish company) seem to show an intention of designing apps that can mimic real life communication although these apps cannot provide a platform for emergent narrative because they are not AI-based.

This being said, it is difficult to predict if the future narrative app design would be interested in emergent narrative. Above all, narrative apps, like picturebooks, are commercial products. Companies may only consider developing an AI-based narrative app when they can foresee a commercial success, especially considering that AI technology is not easily affordable.

Branching narratives and foldback narratives, on the other hand, are strategies often seen in narrative apps. To have a systematic discussion of narrative structures in narrative apps, I will use the 35 typological criteria developed in Chapter Three as my main theoretical base while applying narratological concepts of *nuclei* and *catalyses* in discussions of semantic narrative structure in individual scenes, and video game design concepts of *branching narrative*, *foldback narrative*, *dramatic action*, and *emergent narrative* in discussions of physical narrative structure, or the traversal routes of the interpreter.

Further Exposition of the Typology

The 35 typological questions developed in Chapter Three reflect two major situations where the narrative structure can be influenced by the mechanics of the text. These two situations are both related to physical involvement on the part of the interpreter.

The first situation is where the interpreter does not have any physical involvement in (certain moments of) the narrative production, or the interpreter’s physical involvement in (certain moments of) the narrative production is a non-selective movement which does not change the narrative structure in any way. This situation can be visualised using the theoretical route map shown in figure 4-7. In this situation, the mechanical relationship between the signs and the medium plays a crucial role in the presentation of the narrative structure.

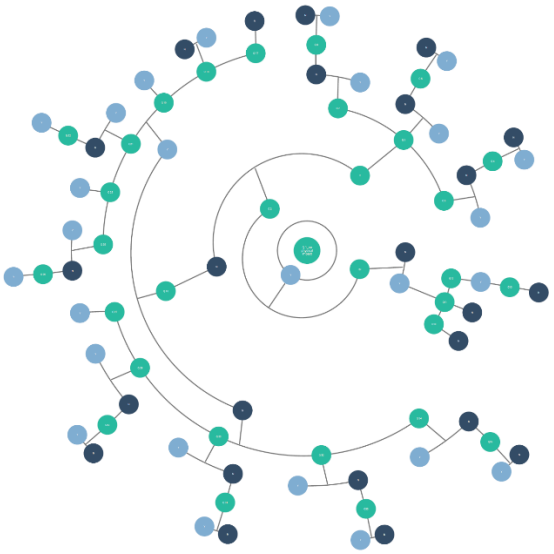

Figure 4-7: The theoretical route map of the MTB pattern where the interpreter has no physical impact on the narrative structure of the text. A zoomable version of this image is provided in Appendix K. This map is part of the storytelling mechanism theoretical route map presented in figure 3-7. The 35 typological questions that are *not* involved in describing this type of mechanical textual behaviour are: Q14, Q15, Q20, and Q24.

The second situation is where the interpreter is physically involved in (certain moments of) the narrative production, and this involvement requires selective movement which has impact on the narrative structure. This situation can be visualised using the theoretical route map shown in figure 4-8. In this situation, all three relationships in the storytelling mechanism affect the structure of the narrative.

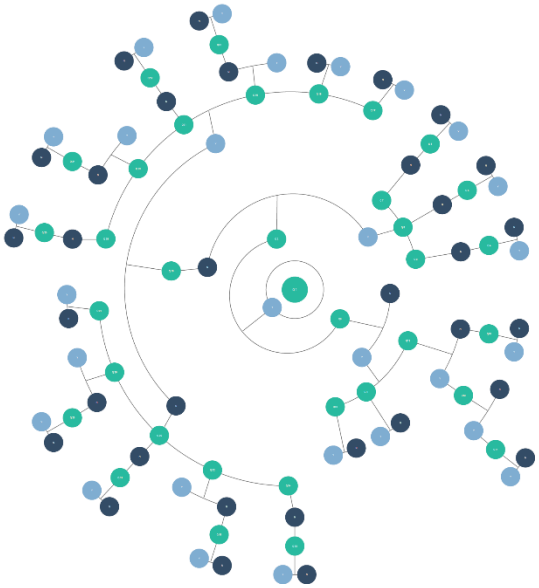

Figure 4-8: The theoretical route map of the MTB pattern where there is physical impact from the interpreter on the narrative structure of the text. A zoomable version of this image is provided in Appendix L. This map is also part of the theoretical route map of the storytelling mechanism theory presented in figure 3-7. All the 35 typological questions are involved in describing this type of mechanical textual behaviour.

Considering that narrative apps contain complicated narrative patterns as demonstrated in the previous chapter, when a narrative app requires selective movement on the part of the interpreter, I will break down the narrative structure of it into two temporal parts to examine them separately under these two situations. The first temporal part concerns the textual behaviour before the

interpreter's selective movement, and the second part concerns the textual behaviour after the selective movement. The following sections will explain this in detail.

Situation One – No Physical Impact (Figure 4-7)

When the presentation of signs does not involve physical efforts from the interpreter (i.e. the interpreter does not have any physical contact with the medium in any way[55]), or the physical efforts are *non-selective* (i.e. the interpreter does not have any physical influence[56] on narrative content or the medium in any way), the medium seems to be the only element that may influence the presentation of the narrative structure at the moment of the interpreter's traverse[57]. In other words, in this situation, the nature of the medium decides what can be presented and how. Thus, it seems that to understand the relation between the medium and the narrative content in this situation is the key to analyse the narrative structure of narrative apps.

As reflected in the theoretical route map in figure 4-7, the nature of the medium may influence the stability of signs, and the stability of signs may affect the presentation of signs (i.e. the materialised narrative content). The *stability of signs* in this chapter addresses both the content and the position of signs. The *position of signs* refers to both the temporal arrangement (the sequence of appearance in the medium) and the spatial arrangement (the position to each other in the medium) of signs. Under this circumstance, when the interpreter has no physical impact on the narrative outcome, there are two types of MTBs to consider, namely, *stable presentation on the stable medium*, and *unstable presentation on the stable media*.

Stable Presentation on the Stable Medium

In this type of MTB, the content and the position of signs do not change in the medium. Specifically, a stable MTB may behave in either of the following ways:

[55] In this case, the sense of touch is invalidated.

[56] For example, eye movement is counted as physical effort in this research, but it does not influence the narrative structure of a text in a physical way. Turning pages of a book with no paper engineering is also considered as physical involvement, but it does not influence the narrative structure either. In the same manner, shifting scenes in a narrative app is not considered as changing narrative structure of the text.

[57] This statement is only meant to describe the situation at the current stage of the technology development. It is open to update and revision should the situation changes in the future. I anticipate that in the future, we may be able to control and alter the structure of a text without performing physical action.

1. All signs must be presented in the medium with the same arrangement during the same moment of different traverses, i.e. every momental piece of the traverse is linked with a scripton whose content and whose adjacent scriptons' content remain the same, and its position to its adjacent scriptons does not change, but each momental piece of the traverse is allowed to have scriptons that are different from those in other momental pieces (see figure 4-9).

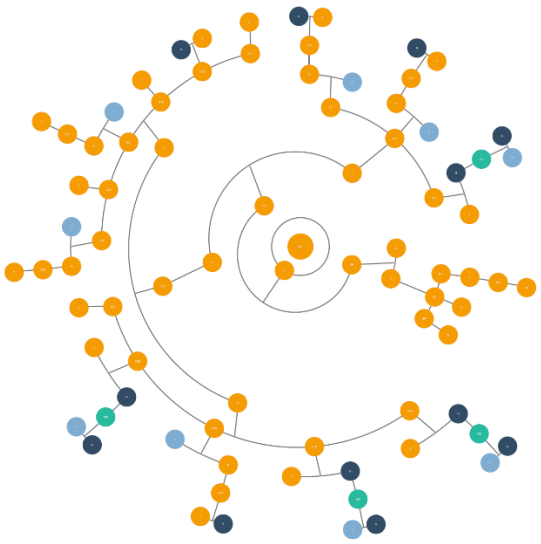

Figure 4-9: The theoretical route map of situation one. A zoomable version of this image is provided in Appendix M. It is built on the map shown in figure 4-7. In this map, the routes occupied by orange dots are those that will be covered by this type of mechanical textual behaviour. The orange routes are: Q1-Y leads to Q2 and Q9. Q2 leads to both Y and N. Q2-Y leads to Q3-Y, Q5-N-Q6-Y, and Q7-N-Q8-Y respectively. Q2-N leads to Q16. Q16 leads to both Y and N. Q16 Y leads to Q17-N, Q18-Y, Q19-Y, Q21-N-Q22-Y, Q23-Y, and Q25-N-Q26-Y respectively. Q16-N leads to Q27-Y, Q28Y, Q30-N-Q31-Y, Q32-Y, and Q34-Y respectively. Q9 leads to both N and Y. Q9-Y leads to Q10-N, Q11-N, and Q12-Y-Q13-N respectively.

   - This description means that if a MTB meets this condition, it may have different sign arrangements during different moments of the same traverse, but the variation of the difference is none. This behaviour can be seen in, for example, codex literature, films, animations and recorded music. Specifically, in a novel or a picturebook, signs are printed and fixed on each page. If we take the moment spent in reading each page as a momental piece, every momental piece contains exactly the same arrangement of scriptons and the adjacent scriptons of every scripton doesn't change either. By turning pages, the reader cannot alter the presentation of the nuclei and the catalyses in these pages. In a book, every page normally contains different signs, and therefore, each momental piece of the traverse may be different from one another. Films, animations, and recorded music behave the same way. Like reading a book, the audience cannot affect the content in these artistic forms. If we divide a film, an animation, or a piece of recorded music into several momental sections, each section contains presumably different content. Although each momental piece contain unstable

signs, the way these texts present the signs stays the same. In all these case, the media are stable, and the MTBs are stable too.

2. All signs must be presented in the medium with the same arrangement during different moments of different traverses, i.e. every momental piece of the traverse is presented with exactly the same scriptons in terms of their content and position to each other (see figure 4-10).

    - This description means that if a MTB meets this condition, it must have same sign arrangement at all time. A painting on a single canvas, for example, has this type of behaviour. Paintings have fixed signs. Being displayed on a single canvas means that all the signs and same signs of this painting are presented to the interpreter at any moment of her/his traverse. Like reading a book, watching a film and listening to music, the interpreter does not have any physical influence on the content structure.

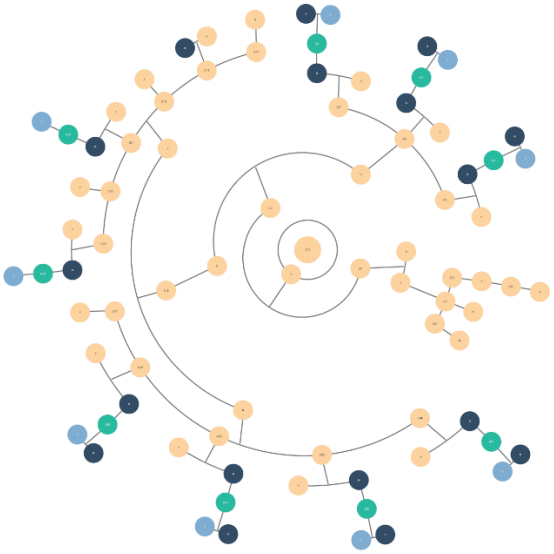

Figure 4-10: The theoretical route map of situation two. A zoomable version of this image is provided in Appendix N. It is built on the map shown in figure 4-7. In this map, the routes occupied by flesh-colour dots are those that will be covered by this type of mechanical textual behaviour. These routes are: Q1-Y leads to Q2 and Q9. Q2 leads to both Y and N. Q2-Y leads to Q3-Y, Q5-Y and Q7-Y respectively. Q2-N leads to Q16. Q16 leads to both Y and N. Q16-Y leads to Q17-N, Q18-Y, Q19-Y, Q21-Y, Q23-Y, and Q25-Y respectively. Q16-N leads to Q27-Y, Q28-Y, Q30-Y, Q32-Y and Q34-Y respectively. Q9 leads to both Y and N. Q9-Y leads to Q10-N, Q11-N, and Q12-Y-Q13-N respectively.

From another perspective, these two types of behaviours address two types of signs: one is that signs are not still, but they have the same arrangement during different traverses, i.e. every momental piece of the traverse has fixed scriptons, but these momental pieces may not share the same scriptons; the other is that signs are still and fixed in a text, i.e. all momental pieces of the traverse have the same scriptons, or different traverses have the same scriptons. In other words, for a stable MTB, all textons, in a specific momental piece of the traverse or in the whole

complete traverse, are shown or revealed by the text itself as scriptons to the interpreter in a fixed sequence, while the scriptons and their adjacent scriptons are always the same. In this situation, the *nuclei* and the *catalyses* of the narrative do not change, and the traversal route for the interpreter is linear, so the narrative structure of such texts is fixed[58]. The interpreter will not be allowed to take any dramatic action while traversing such kind of texts.

Overall, narrative apps do not fit in the situation where the interpreter's physical effort has no impact on their narrative structure because there are usually hotspots to activate in narrative apps while such activation is considered in this thesis as a selective movement that may change the narrative structure to various degrees. This point will be discussed in detail in the later section of 'Physical Impact'. However, if we break down a narrative app into different scenes, consider each scene as a narrative unit that contains a set of *nuclei* and *catalyses*, and examine the MTB in each scene, we may find that some apps contain scenes whose MTB is stable (or stable in the first temporal part of the narrative structure), and whose *nuclei* and *catalyses* are fixed.

These scenes usually fall into two categories: the first one is that they do not contain hotspots that can generate additional narrative content at all, and therefore do not require selective movement on the part of the interpreter; the other one is that they have hotspots that can generate additional narrative content, but before activating these hotspots, the MTB in these scenes are stable. From the app database obtained by this research, these scenes usually resemble either print pages from picturebooks where signs are still, or films and animations whose signs are dynamic but whose temporal and sequential arrangements do not vary.

For the first category, for example, *The Nutons' Kitchen or How to Nurture a Gnome* (2012/2016) (*Nutons* for the shortened title) is an app containing both First and Second Generation app features. If one wants to read the narrative by oneself, one can touch the icon with three lines at the top right corner of the scene (see figure 4-11) to reveal the corresponding scene that contains still words and images. Such scenes look exactly like pages from

[58] In this type of texts, we may not need to consider the medium and the presentation of signs as variables that can cause different perceptions of the narrative.

picturebooks, except that they also contain a recorded narrator's voice and background music[59], but these auditory elements are embedded with the scenes and cannot be altered by the interpreter, so they may be regarded as having little impact on reconstructing the narrative structure in these scenes.

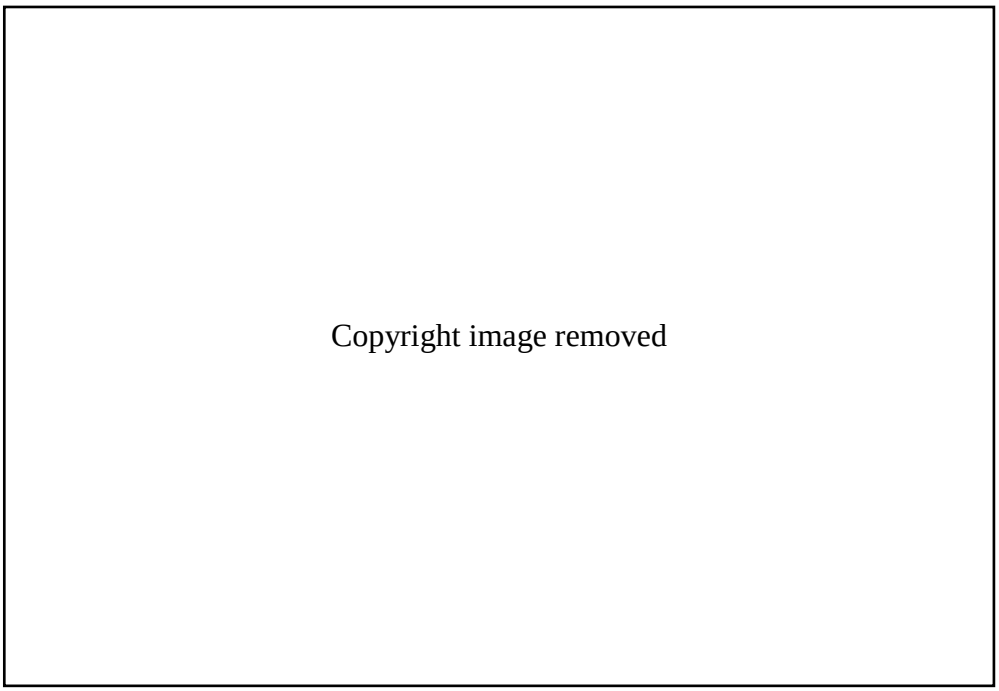

Figure 4-11: Two screenshots of two NSs in *Nutons* (2012/2016). The left screenshot shows a scene where the interpreter can listen to the narration and play with hotspots. The right screenshot is the 'script' of this scene. In the scene shown in the right screenshot, there are no animated elements except the two navigation buttons (one with three lines, and the other with a gear sign) on the top right.

As the signs are still in these scenes, it can be argued that all the signs appear at the same time when the scene is shown to the interpreter. This temporal arrangement of signs is stable, so is the spatial arrangement of the signs. Therefore, no matter how many momental pieces we divide such a scene into, every momental piece of the same scene contains exactly the same scriptons in terms of their content and their position. In other words, in different momental pieces of the same traverse, signs have the same arrangement, while in different traverses, this MTB does not change. Similar examples can also be found in *SOS Dinos in Distress* (2013/2013) (*SOS* for the shortened title) where there are several scenes presented as still projector slides (see figure 4-12).

[59] If we consider a picturebook being read, for example, by a teacher in a classroom, the teacher's voice serves as unstable medium that makes the catalyses of the narrative unfixed.

Figure 4-12: Screenshots of two NSs in *SOS* (2013/2013). In the scene shown in the left screenshot, the interpreter can tap on the projector machine on the left bottom corner. The scene shown on the right screenshot is the first slide coming out of this machine. This slide scene contains only still signs.

Another example for the first category can be found in *Love, the App* (2014/2014). In this app, each scene[60] contains some basic animated effects which are shown automatically by the app, so there is no selective movement required on the part of the interpreter to reveal any hidden narrative content. For example, in NS2 (see figure 4-13), the words fade in to the scene first, followed by a piece of square shaped background being torn off to reveal a drawing of a girl. Afterwards the whole red background turns into something that looks like a paper board which seems to be peeled off a bit from a 'book'. These movements of signs have fixed coordinates on the screen. It means that in different traverses of the same scene, the interpreter will be shown exactly the same arrangements of signs. Thus, no matter which elements are nuclei and which are catalyses in this scene, the ways that they are connected to each other are always the same. Therefore, these scenes can be regarded as having fixed narrative structure.

[60] The premise of this analysis is that we consider what happens during the time spent in each scene as a momental piece of the traverse.

Copyright image removed

Figure 4-13: A screenshot of NS2 of *Love, the App* (2014/2014).

For the second category, we may find an example in *Spot* (2015/2015). There is an animated scene shown in figure 4-14. In this scene, there are two ladybirds designed with movements. The ladybird standing close to the table moves its first two legs periodically, and at the same time, the ladybird standing on the ladder seems to be fixing something with an electric welding. This scene requires the interpreter to zoom in to change the focus of the scene from a bird's-eye view of the room to a detailed view of the things on the table (see figure 4-15). However, if one does not perform any action on this scene, the short animation of the ladybirds will loop itself forever by showing the two ladybirds repeating their movements.

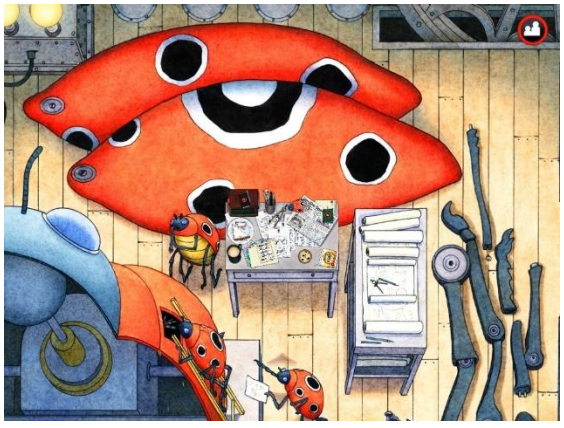

Figure 4-14: A screenshot of NS1 in *Spot* (2015/2015).

Figure 4-15: A screenshot of NS2 in *Spot* (2015/2015).

If we do not consider this scene as consisting of a momental piece of the traverse, but instead, divide this scene of animation into several micro momental pieces with each piece containing the complete movements of the two ladybirds before they repeat themselves (that is, the ladybird near the table raises his legs and puts them down, while simultaneously, the ladybird on the ladder turns the electric welding on, tries to do the fixing and then stops his electric welding). By comparing these momental pieces of the scene, we will see that each momental piece shows exactly the same movements of the ladybirds with one another. In other words, in this scene, at different moments of the same traverse, all signs are presented with the same arrangement, while this MTB does not change in a different traverse for the same scene.

Unstable Presentation on the Stable Medium

Under the context where the interpreter has no physical impact on the narrative structure, in a text that has unstable MTB, the content and/or the position of signs are not fixed. An unstable MTB may behave in either of the following ways[61]:

1. During the same moment of different traverses through the text, signs are not presented in the medium with the same arrangement. This means, the scriptons must have the ability to vary in content and/or in position in one or more momental piece(s) of the traverse (see figure 4-16).

2. During different moments of different traverses through the text, signs are not presented in the same arrangement. This means, the scriptons must vary in content and/or in position in each and every momental piece of the traverse (see figure 4-17).

The difference between the two situations lies in the number of momental pieces of the traverse that contain unstable scriptons. For the first situation, not all momental pieces necessarily have unstable scriptons, but for the second situation, every momental pieces must have.

[61] Theoretically speaking, both conditions apply to texts with either still signs or dynamic signs, but in the empirical data collected by this research, I only found texts with dynamic signs behave in these two ways.

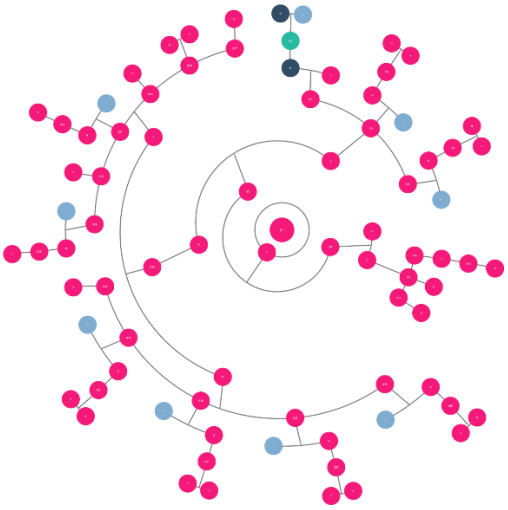

Figure 4-16: The theoretical route map of situation three. A zoomable version of this image is provided in Appendix O. In this map built on the map shown in figure 4-7, the routes occupied by pink dots are those that will be covered by this type of mechanical textual behaviour. These routes are: Q1-Y leads to Q2 and Q9. Q2 leads to both Y and N. Q2-Y leads to Q3-N-Q4-Y&N, Q5-N-Q6-Y&N, and Q7-Y respectively. Q2-N leads to Q16. Q16 leads to both Y and N. Q16-Y leads to Q17-N, Q18-Y&N, Q19-Y, Q21-N-Q22-Y, Q23-Y, and Q25-N-Q26-Y respectively. Q16-N leads to Q27-Y, Q28-N-Q29-Y&N, Q30-N-Q31-Y&N, Q32-N-Q33-Y&N, and Q34-N-Q35-Y&N.

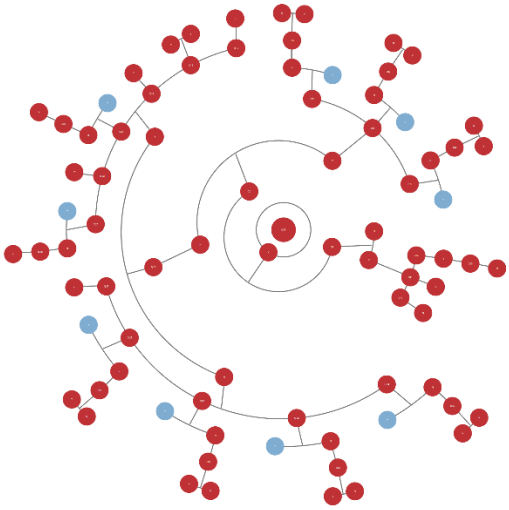

Figure 4-17: The theoretical route map of situation four. A zoomable version of this image is provided in Appendix P. In this map built on the map shown in figure 4-7, the routes occupied by red dots are those that will be covered by this type of mechanical textual behaviour. These routes are: Q1-Y leads to Q2 and Q9. Q2 leads to both Y and N. Q2-Y leads to Q3-N-Q4-Y&N, Q5-N-Q6-Y&N, and Q7-N-Q8-Y&N respectively. Q2-N leads to Q16. Q16 leads to both Y and N. Q16-Y leads to Q17-N, Q18-Y&N, Q19-Y, Q21-N-Q22-Y, Q23-Y, and Q25-N-Q26-Y respectively. Q16-N leads to Q27-Y, Q28-N-Q29-Y&N, Q30-N-Q31-Y&N, Q32-N-Q33-Y&N, and Q34-N-Q35-Y&N.

Theoretically speaking, in both situations, the physical narrative structure of the text is nonlinear, the semantic narrative structure of the narrative content is not the same, but the content of nuclei and catalyses of the narrative may or may not change. Precisely, if the scriptons vary only in position but stay the same in content, it is arguable that the content of nuclei and the catalyses are the same even though their positions in the medium may change. However, if the temporal and/or spatial position of the nuclei and/or catalyses change, presumably, it may have some impact on the perception of the interpreter, so the semantic narrative structure may not be perceived as the same. If the scriptons vary in content, the semantic narrative structure

will be considered variable because the *catalyses* change and the *nuclei* may or may not change[62]. To be precise, a text can have its key narrative content remaining the same while its subordinate content changing from time to time. In this case, the fabula (what happened) of the narrative is fixed, but the discourse (how it is told) varies. A text can also have both its key narrative content and its subordinate content change from time to time. In this case, both the fabula and the discourse of the narrative vary.

From a video game designer's perspective, the physical narrative structure of such texts is linear because the interpreter has no influence on the narrative outcome. However, without considering the interpreter's involvement, these texts have similar physical nonlinear structures as a branching narrative or a foldback narrative does. The difference is perhaps that during the interpreter's traverse, it will be the text instead of the interpreter that decides which branching point to take to push the narrative forward. In other words, it will be the text that takes 'dramatic actions' if it has a branching narrative structure.

Based on the empirical data collected by this research, this type of texts is usually seen in computer-mediated literature, particularly video games, where scriptons are not fixed due to the procedural power of a computer. For narrative apps, most of them do not seem to have the variety of scriptons as much as a video game may afford, but they have basic MTBs described in this section previous to any selective movement of the interpreter.

For instance, the narrative app *Jack and the Beanstalk* (2014/2017) (*Jack* for the shortened title) is an app adaptation of the famous English fairy tale of Jack and the Beanstalk. Some of the characters in the app, such as Jack and his mother, are designed to speak *to* the interpreter, but these characters are not AI based. This means, their speeches are pre-written. This pre-written script contains many speech options, such as 'Hello!', 'It's nice to meet you!', 'You look friendly!' and 'Have you met my son Jack?', to name a few. The interpreter can tap on the character to trigger a speech. If the interpreter does nothing in a scene, the characters will start to speak in turns, but their speeches do not necessarily come out every time in the same order. In other words, the scriptons vary in these scenes, so the interpreter may be presented with

[62] According to Barthes and Duisit (1975), 'a catalysis necessarily implies the existence of a cardinal function [i.e. a nucleus] on to which it can depend, but the implication is not reversible' (p.251). This indicates that if a nucleus changes, its catalyses as dependents will change with it. This is to say, if the content of a scripton/scriptons change(s), this situation indicates a definite change of a catalysis/catalyses.

different scriptons when s/he traverses the same scene for a different time. However, the number of such variation in the app is limited as the number of textons (the pre-scripted speeches) is limited.

Figure 4-18: A screenshot of NS1 in *Jack* (2014/2017).

Specifically, figure 4-18 shows a screenshot of the first NS of *Jack* (2014/2017) app. This scene involves two characters, Jack and his mother. During the times when I stayed in this scene without touching anywhere on the screen, what happened was, it was usually Jack who spoke to me first and then his mother. It seemed that Jack would say some pre-scripted lines, but would not finish speaking all the speech textons before his mother took the turn. Jack's mother would not exhaust her speech textons either before Jack spoke to me again. Thus, the two characters took turns to speak in a nonstop manner until I left the scene. However, there seemed to be no pre-scripted order for the presentation of these speech textons because they came out randomly, and sometimes the characters repeated what they had said previously before saying something new. For instance, there was once, I heard Jack say 'Hello!', and after a little pause, he said something else. Then his mother took turn to say 'Have you met my son Jack?' which was followed by a few other lines. When Jack took his turn back, he said 'Hello!' again. Just when I thought that he would repeat whatever he has said in the first round all over again, he started to teach me how to traverse through the app by, for example, touching the blue arrow, and zoom in and out, which were new speeches to me at the time of my traverse.

This scene in *Jack* (2014/2017) is different from the ladybird scene of *Spot* (2015/2015) discussed previously. Both scenes contain dynamic signs, but the ladybird scene can be considered as consisting of a loop of same actions, or a loop of the same scriptons. The *Jack* app, however, does not. If we consider every scene as a momental piece of a complete traverse in the app, for this scene, every time when we come back to it, we may be presented with a different order of the same speech textons of the two characters, while different combinations of textons are considered to form different scriptons. Therefore, this scene behaves the way described in the first situation where signs do not have the same arrangement at the same moment of different traverses.

Another way to analyse the MTB in this scene is that we may consider this scene as a narrative unit, and divide the traverse of this scene into some momental pieces with each piece containing a smaller narrative unit. In this case, the MTB in this scene accords with the description of the second situation where signs are not presented with the same arrangement at different moments of different traverses.

Specifically, if every time when a character says something, we take this moment as a momental piece, then, each momental piece of the traverse in this scene will be assigned with a speech scripton[63]. For example, 'Hello!' will be considered as belonging to a momental piece, and 'Have you met my son Jack?' belongs to another one. If we compare these momental pieces with each other in the same traverse, that is, we stay in this scene and examine the MTB in each momental piece of this stay, we may find that they may contain different speech scriptons in terms of their content. If we traverse this scene several times, and compare the same moment in different traverses, say, compare the MTB in the first momental piece in the first traverse with the one in the second and third traverse, we may find that these pieces may also contain different scriptons. For example, for the first traverse, the first speech of the character who speaks first to an interpreter may be a 'Hello!' from Jack, but in the second traverse, the first speech of the character who speaks first to the interpreter can be 'You seem friendly!' from Jack. This means that the scriptons vary mainly in content in each and every momental piece of the traverse through this scene.

[63] Here I use 'speech scripton' instead of 'script texton' because this discussion is about presentation of signs, i.e. scriptons.

As for narrative structure of this scene, its physical structure is nonlinear, its semantic structure is unstable but this instability may not have much impact on the overall narrative structure of the app. This is because, based on my experience with the app, if we allow Jack and his mother exhaust their pre-scripted speeches by themselves before moving to the next scene, we will be presented with every nucleus and catalysis[64]. The perception of the narrative in this scene may vary in different traverses due to the change of the sequential appearance of a nucleus or a catalysis, but such variation of the perception does not seem to play a decisive role in understanding the narrative told in this app.

Situation Two – Physical Impact (Figure 4-8)

When the presentation of narrative content involves selective movement on the part of the interpreter, both the medium and the interpreter can influence the narrative structure of a text. In this situation, the (nature of the) medium must afford the possibility of selective movements, while a selective movement indicates that the narrative involves optional narrative content from which the interpreter can choose. In this type of texts, the narrative content as scriptons are usually unstable semantically, temporally and/or spatially.

To be specific, if the interpreter is allowed to build her/his own narrative branch with chosen optional narrative content during her/his traverse of the text, this means that the unchosen options in this specific stage of the traverse are not presented to the interpreter. From then on, there may be two basic possibilities:

1. *Some of or all the unchosen options do not appear again in the later stage of the same traverse*. This means that not all textons can be revealed by the interpreter or by the text's own mechanics in a complete traverse. In other words, some of the catalyses and/or nuclei will be unknown to the interpreter when s/he completes a traverse. In this case, the interpreter may experience different narrative content (but to various degrees[65]) in

[64] A nucleus or a catalysis can be constituted by one or more scriptons depending on one's perspective and research purpose. For example, we can regard a sentence as a scripton, but can also regard every word, letter, or punctuation mark as a scripton.

[65] If the optional narrative content only contains catalyses, different traverses of the same text will only give the interpreter different experiences of the discourse, but the backbone of the narrative, namely, the fabula, does not change for the interpreter. If the optional narrative content contains nuclei, the interpreter will experience different fabulae in different traverses. This suggests that this type of mechanical textual behaviour may exist in both single fabula apps and multiple fabulae apps.

different traverses, so the physical narrative structure of such a text is nonlinear, and the sematic narrative structure is unstable.

2. *The unchosen options appear again and again in later stages of the same traverse until all the unchosen options are chosen by the interpreter.* This type of textual behaviour may exist in two situations. In both situations, the physical narrative structure of the text is nonlinear, the semantic narrative structure is unstable.

    a. In the first situation, the text's own mechanics allows all textons to be revealed by both the interpreter and the text's own mechanics in a complete traverse of the interpreter. In other words, there is no narrative content hidden from the interpreter, so the content of the nuclei and the catalyses are the same for the interpreter during her/his different complete traverses of the same text. However, the temporal and/or spatial position of these nuclei and the catalyses are different in different traverses. Theoretically speaking, reordering nuclei in the actual storytelling may not change the fabula of the narrative, which means the positional variation of narrative content may not have decisive influence on the interpreter's general impression and perception of the narrative.

    b. In the second situation, in a complete traverse of the text, the text's own mechanics allow all textons *related to the interpreter's selective movements* to be revealed by the interpreter, but the rest of the textons may or may not be presented to the interpreter by the text's own mechanics. In this situation, depending on the narrative function of the unpresented textons, the interpreter may experience different fabulae in different traverses (when the unpresented textons contain nuclei), or experience different discourses but same fabula in different traverses (provided that the unpresented textons only contain catalyses).

In comparison, the MTB of this type of texts is similar to that discussed in the previous section of 'Unstable Signs on the Stable Medium'. Theoretically speaking, both types of textual behaviours may or may not have hidden narrative content from the interpreter during her/his complete traverse, i.e. all the textons may or may not be revealed by the text's own mechanics or by the interpreter during the interpreter's complete traverse. A major difference between the

two behaviours perhaps lies in the degree of the interpreter's control of the narrative outcome. The more selective movements a text allows its interpreter to take, the more control the interpreter may feel that s/he has on the narrative construction. The remainder of this section will focus on the impact of selective movements on the narrative structure. The analysis will be divided into two parts[66]: *stable nuclei with unstable catalyses*, and *unstable nuclei with unstable catalyses*.

Stable Nuclei with Unstable Catalyses

In this situation, the text may only provide one fabula (what happened), but multiple discourses (how 'what happened' is told). The text's mechanics may present some or all nuclei by itself. If it only presents some nuclei, it may require an ideal interpreter to select the rest of the consequential events (nuclei) accordingly and in a fixed sequence, but it may not require the ideal interpreter to select all the optional narrative units (catalyses) between these consequential events, nor may it require the catalyses to be selected in a fixed order. As the nuclei are stable, the interpreter's selective movements may not influence the development of the fabula. This type of texts usually has a foldback narrative structure that provides one beginning, one ending, one set of nuclei[67], but optional catalyses, so they do not afford dramatic actions. Single fabula narrative apps belong to this category.

Take the narrative app *Lil' Red* (2012/2013) for example. As introduced in Chapter One, this wordless app is an adaptation of the Little Red Riding Hood story. The fabula of the app can be summarised with the following nuclei: one day, a girl was given a task by someone to bring a basket of something (not shown in the scene) to a house where an old lady resided (NS1), but a wolf awakened by falling pinecones (NS3) saw her during his walk (NS4, NS5). He talked with the girl and got to know about her task (NS6). He thus decided to arrive at the house before her (NS8). He locked the old lady in her wardrobe, pretended to be her, and swallowed the girl after she arrived (NS9). After eating the girl, the wolf was caught by a woodcutter who gave a hard lesson to the wolf and saved the girl (NS10). The wolf ran away after being beaten and encountered three little pigs (NS11). The fabula ends here.

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[66] These two parts are meant to be two indicative categories, but they are not intended to be the only categories found in this situation where the interpreter has physical impact on the narrative outcome.

[67] This is just a description of one type of foldback narrative structure. It does not mean that a foldback narrative must contain one set of nuclei. As indicated previously, a foldback narrative may contain different nuclei but they must all lead to the same inevitable events.

For the sake of argument, I will call an NS containing nuclei as *nucleus-NS*[68], and the one without any nucleus as *catalysis-NS*. The nuclei of the app are distributed in sequential NSs, but sometimes there are some catalysis-NSs arranged in between two nucleus-NSs. For example, NS2[69] (see figure 4-19) can be considered as a catalysis-NS as the narrative content contained in these scenes do not contribute to the fabula development. If the interpreter neglects NS2, or if s/he stays in NS2 but does not help the girl to pick up flowers, help the bird to eat an earthworm, or tap on the hedgehog to let it roll into a ball, s/he will not be confused by the future development in this narrative.

Figure 4-19: A screenshot of NS2 of *Lil' Red* (2012/2013).

Figure 4-20: A screenshot of NS6 in *Lil' Red* (2012/2013).

In a nucleus-NS of this app, there is some additional narrative content that are catalyses which do not necessarily need to be executed. For example, in nucleus-NS6 (see figure 4-20), there are some mushrooms growing on the tree. Every mushroom can sing a musical note if tapped on. This type of design may be entertaining to the interpreter, but is not necessary for her/him to understand the future events. However, by neglecting these catalyses, as Schwebs (2014) demonstrates in his analysis of *Lessmore* (2011/2015), the interpreter 'misses one of the fundamental affordances of the app aesthetics' (p.6).

As for the nuclei of this app, the app provides the interpreter with some nuclei, but requires the ideal interpreter to reveal the rest. For example, in NS1[70], one needs to tap on the hand to reveal the task given to the girl. In NS3, one needs to tap on the pinecones to let them drop on

[68] This does not mean that the NS contains only nuclei. It may also be accompanied by catalyses.
[69] This scene was described in Chapter Three with figure 3-13. As elaborated in Chapter Three, there are many entertaining hotspots, but none of the related narrative content contribute to the fabula development.
[70] Chapter One described this scene in detail with figure 1-13 on p.47.

the wolf to wake him up (see figure 4-21), and in NS9, one needs to tap on the speech bubbles or the girl and the wolf respectively to reach the stage where the wolf devours the girl (see figure 4-22). To save the girl, one also needs to tap on the woodcutter in NS10 (see figure 4-23).

However, the app has a default, that is, every NS presumes that the interpreter has executed all the nuclei in previous NSs. This means, in reality, even if the interpreter fails to trigger some nuclei, s/he will not affect the development of the narrative in the app. In this case, to say that the interpreter has physical impact on the narrative outcome in this type of apps is to suggest that the interpreter may play a crucial role in the presentation of the narrative (structure), but s/he does not have any actual influence on altering the content of nuclei and catalyses of the narrative as these elements are pre-written.

Figure 4-21: A screenshot of NS3 in Lil' Red (2012/2013).

Figure 4-22: A screenshot of NS9 in *Lil' Red* (2012/2013).

Although the fabula of this app does not change and every nucleus and catalysis are pre-written, as the app's mechanics requires the interpreter to trigger some decisive events, it may give the interpreter an impression of co-writing the narrative with the author, and may thus make the interpreter believe that s/he plays a decisive[71] role in constructing the narrative. As Stichnothe (2014) comments, this app lets its interpreters 'participate in enacting narrative patterns, not only receiving but actively taking part in shaping them' (p.6). This feeling of involvement in the narrative construction is presumably stronger than that felt by an interpreter traversing a text without any physical impact on the narrative outcome. However, this is not to

[71] In fact, the interpreter does not play decisive role in this app, as whatever s/he trigger or not trigger in a scene, the future events in this app do not change.

suggest that either kind of text is better than the other in terms of their narrative quality and aesthetic value.

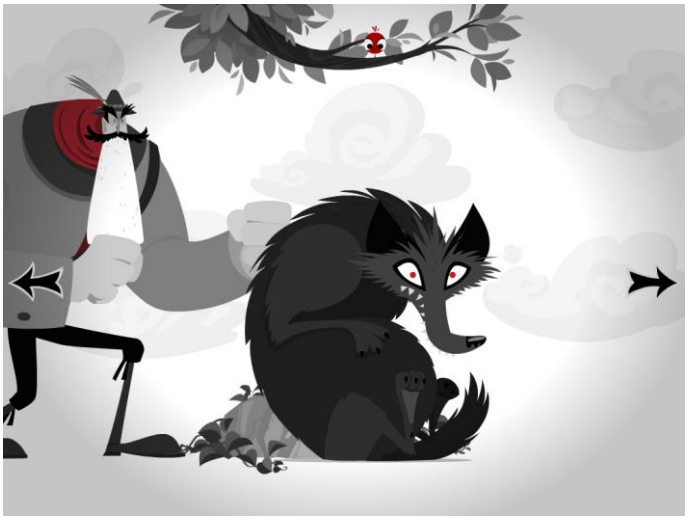

Figure 4-23: A screenshot of NS10 in *Lil' Red* (2012/2013).

Moreover, as all the scenes are wordless, the app requires the ideal interpreter to speculate the arrangement of signs, and act upon reasoning or imagination, tapping on characters or objects to release the hidden nuclei. In Al-Yaqout and Nikolajeva's words (2015), this level of interpreter participation 'leads into imaginative co-creation' of a narrative (p.7), which does not seem to be afforded by texts allowing no physical impact on the part of the interpreter. In other words, the narrative structure and the MTB in narrative apps such as *Lil' Red* (2012/2013) may seem similar to those discussed in the section of 'Unstable Signs on the Stable Medium', but the degree of interpreter participation and the sense of accomplishment may differ in various degrees.

Unstable Nuclei with Unstable Catalyses

In this situation, the text may provide multiple fabulae and multiple catalyses. Multiple fabulae suggests that this type of storytelling usually has different endings, which means that this type of text has branching narrative structure that may contain one beginning, multiple endings, and multiple nuclei and catalyses in between[72]. The ways for the interpreter to execute nuclei and catalyses in this type of texts are mostly the same as those discussed in the previous section, however, there is one essential difference between these two types of texts. Texts that

[72] Again, this statement does not suggest that all branching narrative structures must be built like this.

belong to this category do not present all nuclei to the interpreter as the interpreter is usually required to choose one fabula out of many to complete her/his traverse. Thus, the nuclei in this type of texts are unstable. Some of the interpreter's selective movements may qualify as dramatic actions that have crucial influence on the development of the narrative. Multiple fabulae narrative apps belong to this category.

For example, Chapter Three introduced a narrative app called *The Ogress* (2012/2012). This app contains three fabulae (see figure 3-4 in Chapter Three). The first half of them are the same which depicts a selfish princess who ate a lot due to boredom and who eventually consumed almost everything on the earth. Different nuclei start to appear after the NS shown in figure 3-4. In this NS, it is said, 'It became more and more difficult to live on Earth. But what could be done?'. It seems that the app is asking the interpreter for advice, but the solutions are already prepared for the interpreter. There are three of them to choose from. By clicking on any option of the solutions, the interpreter performs a dramatic action that leads to a future that is depicted differently from those in the other two choices.

Compared with single fabula apps such as *Lil' Red* (2012/2013), multiple fabulae apps such as *The Ogress* (2012/2012) may give an impression to the interpreter that s/her has more power over the narrative construction as, for example, it seems to be the interpreter who decides which future events s/he wants to give to the narrative. These apps may (but not necessarily) seem more exciting and surprising to an interpreter. However, like single fabula apps, multiple fabulae apps do not give actual power to the interpreter over the narrative creation as every core and optional events are pre-scripted.

Narrative Structure & Narrative Quality

Although this study was not focused on analysing the aesthetics of a narrative in an app, during the examination of the narrative structure of the apps, this research seems to have found a connection between the narrative structure and the narrative quality, which could be developed into some evaluation criteria for parents, for example, and educators to consider when they select app products for children.

So far, there are various criteria suggested by academics and non-academics for what can be judged as a quality app. For example, one of the evaluation criteria set up by UKLA Digital

Book Award for 2017 entry reads, 'The app gives children different activities, characters and stories to be involved with' (https://ukla.org/forms/view/digital-book-award-form-evaluation-criteria). Some school librarians suggest that a good app should be easy to navigate, for example, and engaging (e.g. Bircher, 2012; Bird, 2011). Among all the proposed criteria, there is one mentioned the most, that is, a good app should have a good story.

From a narratological perspective, having a good story means having both a good fabula and a good discourse. Although it is difficult to set up a universal standard for what can be called a good fabula and a good discourse, based on the previous discussions in this chapter, this thesis proposes a set of exploratory criteria that may be used for judging the *narrative quality*[73] of a narrative app. These criteria are:

- The app's narrative structure (whether it be branching narrative or foldback narrative) should at least contain interrelated nuclei and catalyses, that is, the nucleus-NSs and the catalysis-NSs are related to each other while the catalyses in each nucleus-NS should be related to their dominating nucleus or nuclei.

- The mechanics of the app should be designed such that during the interpreter's traverse, her/his selective movements can contribute to the storytelling in terms of its narrativity. In other words, when the interpreter decides to activate a hotspot, this action together with the additional narrative content triggered by her/him should arguably enrich her/his experience of the narrative.

These two criteria are constructed for narrative apps that have a pre-written script. In other words, most of the nuclei and catalyses are already there stored in the app. Previously, I introduced the concept of emergent narrative which is created through the game play by the player and her/his AI based computer game. A question worth considering here is whether these two criteria are applicable to emergent narratives should the future narrative app adopts AI technology. Theoretically speaking, it may be applicable. However, empirically speaking, if a company wishes to develop a narrative app that has good narrative quality and is also based on AI technology, they will be facing tremendous challenges coming from various aspects.

[73] These standards are not aimed for judging other aspects, such as the entertaining level, of a narrative app.

For example, without considering the financial challenge but in terms of constructing the narrative, as an emergent narrative is more like an impromptu storytelling that has no pre-written script, such a storytelling, if intended to have good narrative quality, requires both the interpreter and the AI characters to be good storytellers who can cooperate with each other to build logical fabula with dramatic discourse. However, it might be too much to ask from a child and/or an adult interpreter to acquire such high-level storytelling skills. As for the AI technology, as Adams (2014) points out, '[t]he industry does not yet have any [AI] software that generates stories good enough for commercial entertainment products' (p.228). Therefore, the possibility of the existence of an AI-based narrative app with quality narrative remains unknown at this time.

A Case Study[74]

Focusing on the narrative app products available in the market, I will use *Lil' Red* (2012/2013) to conduct a brief case study to demonstrate how these criteria can be applied to evaluating the narrative quality of a narrative app. The narrative quality of *Lil' Red* (2012/2013) is considered very good in this thesis because its NSs are well connected, its catalyses arguably have strong dependence on their dominating nuclei, and the interpreter's physical involvement can be considered as constituting (crucial) part of the narrative.

Specifically, in terms of the connection between nuclei and catalyses, it has been mentioned previously that NS2 and NS7 of this app may be considered as catalysis-NSs, and the rest are nucleus-NSs. What is depicted in the catalysis-NSs are events that happened on the girl's way to the old lady's house. NS2 depicts presumably the period when the girl just left her house because we can see the road signs standing at the right corner of the scene. The sign with a heart shape on it should point at the place where she lives as there is a similar heart shape sign hanging outside her house. The road sign showing a pair of glasses should point at her destination as it presents the same sign appeared in the speech bubble of the hand in NS1 (see figure 1-13 on p.47 in Chapter One). The position (close to the right corner of the scene) of the road signs accords with the direction of the narrative flow which is from left to right as suggested by the arrow, suggesting an adventure ahead. The cheerful music, the singing birds, the flower, the

[74] I am aware of some other theoretical methods, such as picturebook theory, multimodality, and various literary critical theories, that can be used to analyse a narrative. The method I proposed here is meant to highlight the link between the narrative structure and the narrative quality.

butterfly, the hedgehog, and even the moving earthworm in this scene seem to set up a joyful tone for the beginning of the girl's adventure, which may also represent the girl's excitement, for example, expectation and imagination of happy things. However, her adventure would not be full of joyfulness as she would be devoured by the wolf in a few NSs. Thus, this scene can be seen as a preparation for creating a dramatic turning point in later NSs.

In the same way as NS2, NS7 (see figure 4-24) is also a joyful scene where the girl walks by a bridge and stands for a while on the bridge looking at (presumably) the falling leaves, the creek and the frog under the bridge. Nothing so dramatic seems to be happening in this scene, but the tranquillity reflected from this scene can be interpreted as the calm before the storm as the girl is one NS closer to being eaten by the wolf. Thus, NS2 and NS7 might not seem to be necessary for the fabula development, but they are connected to the nucleus-NSs in a way that if without it, the dramatic sense of this app's storytelling would perhaps be lessened.

Figure 4-24: A screenshot of NS7 in *Lil' Red* (2012/2013).

In terms of the relation between the interpreter's selective movements and the narrative, firstly, since this app requires the interpreter to generate nuclei, the core of fabula, it ensures the 'co-author' role of the interpreter. In other words, every physical involvement of the interpreter when activating a nucleus is necessary for the narrative construction. Secondly, when the interpreter triggers a catalysis, s/he also contributes to the narrative. To be specific, the hotspots that arguably contain catalyses are playful, for example, the interpreter may tap on the lantern to make it jump (NS1, see figure 1-13 on p.47 in Chapter One), tap on the bird to let it catch the earthworm or tap on the flowers to let the girl pick them up (NS2, see figure 4-19), tap on the pinecones to let them fall elsewhere rather than on the wolf (NS3, see figure 4-21), tap on the

woodcutter to let him blow smoke (NS4, see figure 4-25), tap on apples to let them fall on the wolf's head and let the girl to collect them (NS5, see figure 4-26), tap on the crows and the mushrooms to let them sing (NS6, see figure 4-20), tap on the leaves to let them fall or tap on the frog to let it catch flies (NS7, see figure 4-24), to name a few. By playing with these hotspots, the interpreter may be considered to exemplify the playfulness and carefreeness of a child, and also to help to prepare for the dramatic turning point in NS9 (see figure 4-22) by creating a light and joyful atmosphere along the storytelling. It is necessary to point out that, in NS9 where the girl is supposed to be swallowed by the wolf, the little bird will not sing if being tapped on. The silence of the bird may help to build an anxious mood for the scene. It can also be interpreted as an indicator for danger. In addition, the catalyses hotspots, such as the ball of yarn with two knitting needles fallen on the floor, when tapped on, will jump, and the fallen book on the floor, when triggered, will turn a page, can be regarded as objects that try to convey a message to the girl who does not know that she is already in danger.

Figure 4-25: A screenshot of NS4 in *Lil' Red* (2012/2013).

Figure 4-26: A screenshot of NS5 in *Lil' Red* (2012/2013).

In summary, this brief analysis of *Lil' Red* shows that the catalyses of this app storytelling are closely connected to the nuclei, and the app's mechanics ensures that the interpreter's physical involvement during the traverse will not disrupt the narrative development, but instead, constitute as necessary parts of the storytelling. Therefore, according to these criteria we may conclude that *Lil' Red* is a quality narrative.

Conclusions and Implications

This chapter has undertaken an in-depth analysis of one aspect of the interpretative layer of narrative apps, namely their narrative structure. This narrative structure has been examined from two aspects: the semantic structure of the narrative content and the physical structure of the narrative text. The perspective of this analysis has focused on the relation between the text's mechanics and the narrative outcome, i.e. how the construction of the app's narrative structure may be influenced by the relationship between the interpreter and the narrative content, the relationship between the narrative content and the medium, and the relationship between the medium and the interpreter. To achieve this end, this study has consulted the *Storytelling Mechanism Theoretical Route Map* developed in Chapter Three for basic mechanics of a narrative text, and has turned to scholarship in narratology and video game design respectively for structural analysis of a text.

Based on the theoretical route map, this study has found that the variation of the narrative structure of a narrative app appears to be closely related to the number of the interpreter's selective movements:

- In terms of the physical narrative structure, apps that allow no selective movement on the part of the interpreter usually (but not necessarily) have linear structure, while those who allow selective movements usually have nonlinear structure which can be either branching or foldback.

- In terms of the semantic narrative structure, theoretically speaking, both types of apps seem to be capable of presenting unstable nuclei and catalyses, but apps that allow selective movements on the part of the interpreter seem to provide the interpreter with stronger sense of control over the narrative outcome.

After dividing narrative apps into those that allow selective movement and those that do not, this study seems to have identified some connection between the app's mechanics and its narrative structure. This connection can be summarised as follows:

- In terms of the connection between the interpreter and the narrative content, [1] if the app's mechanics do not invite any selective movement on the part of the interpreter, the

interpreter does not seem to have any influence on the construction of the narrative structure. In other words, s/he does not seem to be able to affect the presentation of the fabula or the discourse, or the nuclei or the catalyses of the app storytelling. [2] If the app allows selective movement on the part of the interpreter, s/he may influence the construction of the narrative to various degrees. If her/his selective movement involves generating nucleus-content, s/he may (but not necessarily) influence the fabula of the storytelling; if the selective movement only involves generating catalysis-content, s/he does not seem to have crucial influence on the storytelling although s/he may change the discourse of it.

- In terms of the connection between the medium and the narrative content, [1] if the app's mechanics do not allow any selective movement on the part of the interpreter, it seems that the medium may play a crucial role in the presentation of the narrative. Dependent on the affordances of the medium and how well the designer can take advantage of such affordances, the medium may be able to present a linear narrative structure as well as nonlinear narrative structure for the app storytelling. [2] If the app's mechanics allow selective movements on the part of the interpreter, the medium, the interpreter and the presented narrative content all actively take part in the narrative production. In this situation, the nature of the medium, above all, must afford such narrative design, i.e. it is possible to use such a medium to display the kind of narrative content that allows selective movements on the part of the interpreter. Afterwards, the interpreter can materialise this structure in the medium by selecting preferred nuclei and catalyses. During the interpreter's traverse, the presented narrative content seems to 'guide' and/or 'inspire' the interpreter's selective movements.

- In terms of the connection between the interpreter and the medium, it is the affordances of the medium that seem to determine the possibility and the degree of the interpreter's selective movements provided that the designer has fully explored the medium's affordances.

Based on the findings, this study proposed two exploratory criteria for evaluating the narrative quality of a narrative app, namely, the app should have interrelated nuclei and catalyse,

and the interpreter's selective movements should contribute to the storytelling. These criteria seem to be challenging for AI-based storytelling environment. However, this study also questions if narrative apps would adopt AI technology for storytelling.

A Summary of the Theoretical Part of the Study

So far, this thesis has presented a conceptual inquiry about how narrative apps tell stories. Throughout this conceptual study, there is something consistently seems to be reflected throughout the discussions, that is, there appear to be discrepancies between how narrative apps are expected to work and how they actually work in real life.

Specifically, Chapter One has introduced that my original assumption was that the narrative app was another form of picturebooks, but the empirical data seemed to have contradicted my assumption, which has caused a significant alteration of my theoretical approach to the subject of this study. Chapter Two has explored the idea of interactivity. It has pointed out that although we may expect narrative apps to be interactive, the apps accessed by this study did not seem to be able to interact. Chapter Three has posited that when the educators are concerned about how to teach digital literacy with the coming of apps, this study seems to have found that, theoretically, MTBs found in narrative apps do not seem to be unique, and it seems that there are no crucial differences between digital and non-digital literature in terms of their MTBs. The current chapter has proposed some possibilities for constructing narrative structure in a narrative app, but not all possibilities seem to exist in the current empirical data. For example, theoretically speaking, it seems to be possible for an app to present nonlinear narrative structure without selective movements on the part of the interpreter, and it also seems to be possible for an app to allow its interpreter to alter nuclei while not changing the fabula of the storytelling, but from the data I collected, I have not found any apps conforming to these conditions. In addition, this chapter has also suggested a possibility of emergent narrative in narrative apps, but it has also expressed some practical barriers which may prevent this from happening.

The discrepancies seemed to suggest that if this study was about to be less biased, besides conceptual understanding, it also needed to understand how narrative apps work as commercial products in real life. In other words, it is necessary to examine what is actually happening in the app market and the app developing companies, to explore why some theoretical findings do not seem to be represented in empirical data, and to consider how to evaluate the narrative app.

Therefore, the next chapter will switch from the theoretical perspective to a practical perspective to examine how the narrative app work as a commercial product.

Chapter Five: The Narrative App as a Commercial Product[75]

> *Future books will be born from digital thinking, drenched in a passion for creative culture in all its forms, and play seamlessly with a variety of technologies. […] Physical books have wonderful and irreplaceable qualities. But digital is only going to conquer ever more of our lives, imaginations and entertainment time.*
>
> (Nuttall, 2017, n.p.)

Introduction

In the previous four chapters, I have described the subject of the study, and reported my conceptual understanding of what the narrative app is and how it tells stories. The interest of the previous chapters was on the presentation of the narrative app, the shaping of the narrative during the direct and instant communication among the interpreter, the medium and the narrative content. The perspective was theoretical.

However, it cannot be overlooked that intrinsically, the narrative app is also a commercial product. The making, selling and maintaining of it involve many factors that are important and may even be vital to a comprehensive understanding of the narrative app. Learning this practical aspect of the narrative app can be beneficial to have a fair evaluation of it as well as reasonable expectations of its narrative and other aspects. This awareness emerged from my personal experience in the development of some narrative apps.

In 2014, I was invited by Audois & Alleuil Editions[76], a French independent company that design narrative apps for children, to help develop an app called *The Great Ghost Chase* (2014/2014). My responsibility was to rewrite the whole narrative in Chinese based on the English and the French scripts (including words, images, and participatory elements) that were already available at the time. To produce a narrative that would fit the concept of the app as well

[75] Some part of this chapter was based on my paper presentation 'Story Apps and the Touchscreen: Challenges and Opportunities for 21st Century Storytelling' in 22nd Annual NCRCL/IBBY UK Conference in 2015. The presented paper was published online by IBBY at http://www.ibby.org.uk/dwl.php?file=storyappsandthetouchscreenpaper-yanzheng-jjh-yz-ready.pdf&f=8&d=176

[76] This company was in business between 2012 and 2016.

as Chinese culture, I turned to the company repeatedly for information about the philosophy behind their designed animated features, to explore the possibility of deleting or adding some catalyses, and to enquire about the reasons why some features would/could not be added to the app.

In 2015, as a narrative app researcher, I was invited to test narrative apps for Nosy Crow, a leading children's publisher in the UK which has won various awards for their narrative apps. I tested two apps for the company, *Snow White* (2015/2017) and *Axel Scheffler's Flip Flap Jungle* (2015/2017). My responsibility was to observe the performance of the apps on my own tablet device, and to give feedback from an academic perspective on its narrativity and performance.

My direct involvement in the app development helped me realise that theoretical perspective is not sufficient to understand what the narrative app is and how it works. From a practical perspective, there are some factors (such as the design concept, the market and the technology) that, in fact, decide what a narrative app can be and how it can work. Some of these factors may not have been faced by codex authors and publishers, and may not occur to narrative app researchers who are outside the app development team.

To obtain a practical perspective for this research, I found it logical to gather information from the insiders in the creation of the narrative app (i.e. the narrative app developers). I collected the desired information from three channels. Firstly, I reflected on my personal experience in the app creation. Secondly, I turned to the published data including the data shared by the app designers on social media and in public talks as well as their published interviews (in verbal, visual and auditory forms). Thirdly, to seek for answers to some questions that could not be answered by my own experience or the published data, I turned to some representative narrative app developing companies. In the following sections, I will use these first-hand empirical data to develop an understanding of the narrative app from a practical perspective to complement my conceptual understanding of it. The discussion will cover three aspects:

- the creation processes of a narrative app,
- the potential challenges faced by the narrative app developing teams,
- the future of the narrative app

Further Explanation

Within the three ways of data collection, my direct communication with the publishers require further explanation.

From 2016 and 2017, I had some formal and informal email exchanges with representatives from two narrative app developing companies and one educational game app developing company respectively. They are:

- Claire Gaudriot, the former Director of Art at Audois & Alleuil Editions;
- Cynthia Nugent, the CEO of Rascal Media;
- David Miller, the Director of Learning at Kuato Studios.

The Selection Rationale

Firstly, a primary reason to select these people to consult was that all of them have involved in making apps with high narrative quality based on my criteria proposed in Chapter Four. A & A's (shortened for Audois & Alleuil Editions) first award-winning narrative app *La princesse aux petits prouts* (*The Poppin Princess*) (2013/2013) made into the headlines in France's most viewed news channel TF1 in 2013, and the rest of their app products have enjoyed a consistent good reputation among reviewers (e.g. Kirkus Review, 2013, Solomon, 2015). Rascal Media developed the award-winning narrative app *The King's Ears* (2016/2016) and Kuato Studios' educational game apps have been recognised by Barack Obama, the previous present of the United States of America, in the 2016 White House Science Fair.

Secondly, as my intention was to develop an unbiased understanding of the narrative app, the selection of a tightly focused but varied representation of publishers seemed appropriate. Specifically, to have cultural variety, I chose three companies based in three different countries: A & A was a French company, Rascal Media is Canadian, and Kuato Studios is British. Providing a variety of backgrounds, I chose three representatives who may represent three distinctively different groups of app creators: Claire Gaudriot is a trained artist, graduating from L'École nationale supérieure d'art de Limoges and Beaux-Arts de Rennes respectively. She is a children's book author, illustrator and a pioneer in the narrative app creation. Her company started to develop narrative apps in 2012, and has four years' experience in narrative app

publishing. Gaudriot's perspective may represent that of the artists who ever shifted their focus from producing children's books to designing children's apps. Cynthia Nugent is relatively new to the narrative app business. She was a literature student before she became a largely self-taught artist who writes and illustrates children's books. Nugent completed a Master's programme in children's literature in the University of British Columbia in 2016. Her master's dissertation explores her own experience of adapting a picturebook to a narrative app. Nugent is an artist with detailed knowledge of children's literature scholarship, particularly of picturebook scholarship. Thus, I expected to hear a different perspective from her and was interested in finding out if her knowledge of the picturebook research had influenced her way of designing the narrative app. David Miller was a graduate from the University of Glasgow and a former English teacher. Miller was the winner of the 2008 Guardian/Pearson UK Teacher of the Year, and is an elected Fellow of the Royal Society of Arts. Considering Miller's background, I expected some educational input from him for my narrative app research.

In addition, to have a variety of apps, I chose three companies that have/had different focuses on app development: A & A was established to produce digital native apps with original stories. In other words, the company was committed to developing apps whose narratives were made for app storytelling and had never appeared on other platforms. Rascal Media focused on codex publishing before trying to make the narrative app. So far it has only one app production, *The King's Ear* (2016/2016) which is an adaptation of an award-winning picturebook, *The King Has Goat Ears* (Jovanovic and Béha, 2008). With one experienced company making 'original' apps, and a less experienced one making adaptation, I was interested to know if there would be any similarities or differences in the app designing process for them.

As for Kuato Studios, strictly speaking, what they have produced are not the narrative apps described in Chapter One, but educational game apps. As they put on their website, 'we turn entertaining games into opportunities to learn' (http://www.kuatostudios.com/about-us/ accessed on 28th June 2017). One of Kuato's first game apps is *Dino Tales* (2015/2016). This app invites children to a prehistoric island with 6 baby dinosaurs. The children can play puzzle games, dig for fossils, discover facts about dinosaurs, and can also ask dinosaur questions to a dinosaur character. This game app captures each session of the child's play and turns it into a storybook in the end. In Kuato's words, children can be 'both adventurer and storyteller' who can read their storybook with family and friends

(http://www.kuatostudios.com/games/dinotales/ accessed on 28th June 2017).

Although Kuato does not make narrative apps in the sense defined in this thesis, I decided to consult them nevertheless because narrative apps usually contain ludic features while many game apps have storylines. This connection between the two kinds of apps is noticeable but is rarely discussed in detail in the narrative app studies. However, understanding the relation between the two kinds of apps can be helpful to comprehend the narrative app better. Thus, I expected that Kuato, as a leading educational game app developing company, could offer some answers that might shed light on this matter.

The Communication with the Professionals

My communication with the three representatives did not quite conform to the standard form of either a questionnaire or an interview. The communication was conducted in the form of email exchanges. I saved my questions in a Microsoft Word file which was sent to my participants respectively via email. They typed their answers in the file received and sent the file back to me via emails too. There were also some follow-up emails exchanges occurred when clarifications were needed on either my questions or their answers. The instrument was a result of my research purpose, and of my sensitivity to both time constraints and the intention to give the interviewees 'thinking time'.

Specifically, the purpose of this communication was to seek professional opinions on some specific questions about the app-making. A questionnaire therefore appeared to be less appropriate to achieve the research aim. This communication did not require an immediate answer, nor was it set up to observe or analyse the participants' behaviours. Therefore, a face-to-face interview did not seem to be necessary. Secondly, a face-to-face interview may put the interviewees in an impromptu position where they may not have enough time to ponder over the question and to offer an answer satisfactory to them. As I hoped to obtain carefully processed, I found it better to let my participants read and answer questions in a written format. Thirdly, my participants were fully engaged in their work. It thus seemed most desirable to them if they could respond to my questions at their convenience. This flexibility might make them more willing to get involved.

It needs to be mentioned that although my participants are professionals in their fields, their

opinions might still be subjective. Their answers might be representative within certain groups of artists and developers, and are helpful to developing a better understanding of the narrative app. However, to have a thorough exploration of the narrative app from the practical perspective, more empirical data are needed.

Additionally, despite the fact that there were follow-up email exchanges in this communication, this is not equivalent to what might be expected from a semi-structured interview in terms of many aspects such as spontaneity. To lessen the impact this limitation may have on my data collection, I tried to arrange my questions in a logical way. I was also aware that the participants' responses to one question might be sufficient to cover some other questions in the list, so I specified that they might skip some questions if they felt that they had already answered them somewhere else in the list.

Furthermore, when designing the questions, I used technical terms that are familiar to my participants, and encouraged them to write in a way that they were most comfortable with. For example, in this thesis, I have argued that 'narrative app' seems to be the most appropriate term to address the subject of this study, but with my participants, I used 'story apps', 'apps' and 'picturebook apps' instead because these terms were used in their working environment. For another example, Claire Gaudriot is French and she was not comfortable with writing in English. To make her more happy and confident to respond to my questions, our email exchanges were all in French. In this way, I anticipated that she would perhaps offer more information.

In addition, I was aware of the fact that although I was involved in some app development, I was not present in the creation from the beginning to the end, which meant that there might be aspects of the app-making that were worth exploring but would not have occurred to me. Hoping to explore the aspects that might be overlooked, in the end of the question list, I encouraged my participants who were narrative app designers to say something that they would like the app researchers to know.

As for the specific questions, those sent to the game app developing company were different from those sent to the narrative app developing companies. This is because the purposes for the communication were different. For narrative app companies, my purpose was to understand their intentions, philosophies and the challenges in creating the narrative app. Therefore, my

questions for narrative app designers covered five aspects:

- The creation of the story
- The designing processes
- The testing processes
- Finance and marketing
- The designer's opinions on the development and the future of the narrative app

My purpose of consulting the game app company was to understand the relation between ludic features and narrative features in the game app and the narrative app. Thus, the questions I asked were focused on the similarities and differences between two kinds of apps.

Although the majority questions sent to Gaudriot and Nugent were the same, I also asked some questions tailored for them respectively. For example, I asked Gaudriot if her opinion or attitude towards narrative app publishing had changed since her company's first app. This question was not posed to Nugent because A & A released four narrative apps between 2013 to 2015: *The Poppin Princess* (2013/2013), *SOS Dinos in Destress* (2013/2013), *The Great Ghost Chase* (2014/2014), and *Pierrot Pierrette* (2015/2015), while Rascal Media at the time had only one app production, *The King's Ears* (2016/2016).

All my participants were happy to be named and gave full and informed consent to being involved in my research. They were aware that they could withdraw anytime from my data collection and analysis should they wished to do so, but they were all supportive throughout my research and appeared to be quite excited about their participation. Nugent in particular offered eight pages of answers with single spacing in a MS Word file. Her eagerness and her detailed answers reinforced my belief that it is necessary and even vital to hear what the narrative app creators wish to express. In addition, as I have some experience in developing narrative apps, these experiences seemed to enable me to enquire about aspects of apps from an insider's perspective, which might have made my participants feel more connected to me, and more willing to open up to me. For example, Nugent wrote to me in a follow-up email, 'I really like that you are asking about the economics of producing picturebook apps – it is so important.' (Personal email, 14 April 2017).

The Creation of the Narrative App

In Chapter One, it has been argued that the narrative app is different from the codex, such as the picturebook. The argument was supported by a demonstration of the differences found in the narrative app presentation and the picturebook presentation. From a designer's perspective, the difference between the narrative app and the codex may also be perceived from their creating processes.

The Creation Process

Generally, in terms of constructing the narrative, besides using words and images to convey ideas as picturebook creators do, narrative app designing teams need to translate their ideas into the computer language, and integrate words, images, sounds, animated features, participatory features and interactive features on a glass screen. That is to say, the making of the narrative app is *an integration of the storytelling and the programming*. Based on my experience and observation, this integration can be broken into several specific designing processes, such as story design, character and setting design, play design, graphic design, animation design, sound design, dubbing design, and coding. In other words, the making of the narrative app involves various expertise. As Colleen O'Connell, the director for digital books at HarperCollins, pointed out in her interview, '[e]ach app […] is the result of the collaborative work of a team of people from across the organi[s]ation, in addition to […] authors, illustrators, and app development partners' (O'Connell, 2015, cited in Wooten and McCuiston, 2015, p.27).

Creating Digital Natives

Depending on the nature of the narrative app and the proficiency of the developing team, the specific process of the app-making may vary. Take Nosy Crow for example. In a talk given by Ed Bryan (2013), the Head of Apps Development at Nosy Crow, Bryan shared their experience in the making of the app *Little Red Riding Hood* (2013/2017)[77]. This narrative app is a digital native app whose storytelling is tailored for touchscreen devices. According to Bryan, what Nosy Crow did first was to decide *how* they want to retell the well-known story of the Little Red Riding Hood on a touchscreen. He showed a photo of their drafted plan, on which the storyline was presented with some small blocks drawn on a piece of paper. Each block was used

[77] A review of the app can be found at APPs for KIDS YouTube channel (https://www.youtube.com/watch?v=nxxt5Q42S9Y).

to represent a major scene in the app, and each contained some key words used to indicate a key plot. The blocks were arranged in the format of a foldback narrative that started with a beginning block and then split into different branches until every branch reached the same block that reads 'The End'. There were some notes alongside some blocks, suggesting the tasks that the developing team wished to design for children to complete. Bryan (2013) explained their rationale behind the design:

> In our new story, you don't just meet the Big Bad Wolf as you wander through the woods […]. You meet 3 other characters too! Help them and they'll help you defeat the wolf when you reach Grandma's house. (n.p.)

With this story plan, Bryan started to design characters and places on the paper, and colour them in on the computer. This phase he found 'most like hard work' (Bryan, 2013, n.p.). When all the characters and other art assets were in colour, he layered[78] them using Photoshop, and made characters in a 'T pose' on the computer 'so animating them later is much easier' (Bryan, 2013, n.p.). This technique was later adopted by Nugent (2016b) when she animated her characters in *The King's Ears* (2016/2016). When finished with designing all the art assets, Bryan used software to add 3D quality to everything and animate them. Afterwards, the programmer did the coding so the app could run in the desired way on an iPad.

The process of making the app may sound straightforward, but according to Bryan (2013) there were some technical and practical factors which were critical for Nosy Crow to consider along the development. For example, Bryan (2013) pointed out that during the designing process, he needed to 'balance the artistic side of things with the functionality of each scene' (n.p.), and also needed to consider the capacity of the app memory[79] while building the backgrounds of the scenes. This suggests that for Nosy Crow, the artistic value of their app seemed to be closely related to two factors: the affordances of the available touchscreen technology and the app store's regulations on apps.

Nugent (2016a) shared a similar experience in the making of *The King's Ears* (2016/2016),

[78] 'Layer' is a technical term in digital image editing. It means to separate different elements of an image. For example, Bryan presented a photo of the character Little Red in layers. In this photo, the character's eyes, pupils, eye lids, eye brows, mouth, hands, arms, body, legs, and shoes were all separated and laid out on the screen.

[79] According to Nugent (2016a), the size of a narrative app is typically expected to be between 500 MB to one GB depending on its graphic quality and animation level.

where her team found their ‘detail-and colour-rich files were bigger than the digital images typically used in games and educational apps’ (p.66). Her programmers were anxious about this oversize problem. They suggested ‘replacing painterly backgrounds with blank screens and reducing the resolution of the foreground elements’ so that they would meet Apple’s regulation as the app was made for iOS system, but Nugent was reluctant to sacrifice the art to have a desired file size. (p.67) Fortunately, they managed to get the permission from Apple to keep the original file size.

What may be inferred from Nosy Crow’s and Nugent’s experiences is that some narrative app designers occasionally might have to yield to the limitation of their chosen medium, giving up or revising some of their ideas during the creation of the narrative app. This means that upon judging the aesthetic quality of a narrative app, it may be better to consider what the nature of its aesthetic defect is (if there is any), i.e. whether the defects are an internal matter, such as the imperfection of the developing team, or an external matter, such as technical limitations and/or market restrictions[80]. External matters are something that are often uncontrollable for the artists. Thus, should it be external reasons that have caused some aesthetic defects of the narrative app, it might be unfair to blame the artists for the defects. It might also be unrealistic to expect the app to be designed in a way that is unlikely to be realised in the current technical situation.

Having said that, there is an interesting point emerged from Bryan’s presentation. His talk was entitled ‘Making Story Apps – The Art of Little Red Riding Hood’ (2013). In this talk, he introduced the technical aspect of the making of the app with a considerable level of detail. Despite the specific audience of the talk, Bryan seems to suggest that Nosy Crow considers technical aspect as an integral part of the narrativity and aesthetics of a narrative app. This insight might not often be seen in the practice of codex storytelling design.

In her interview, O’Connell shared a similar understanding of the narrative app design. She commented:

> [Creating a narrative app] is very much a technical process that begins with sketches that turn into a rough storyboard. The storyboard develops to include everything from sound effects to page-by-page interactions and also how the navigation will work alongside the

[80] This criterion might also be applicable to other ways of storytelling, such as the picturebook.

> text[81] and art. (O'Connell, 2015, cited in Wooten and McCuiston, 2015, p.27)

Apart from Nosy Crow and HarperCollins, A & A also confirms that the technical side is one of many elements that form a narrative app as whole:

> **Gaudriot:** The synergy within the whole team [makes a good narrative app]. Each step of the creation should be considered essential. The text [i.e. verbal signs], the illustrations, the development, the music, the work of the [dubbing] actors/actresses… everything is important[82]. (Personal email, 1 March 2016)

Creating Digital Immigrants

Nosy Crow's case is an example of designing narrative directly for the app format. However, according to Nugent, adapting a picturebook into a narrative app seemed to have a different development process. Despite the fact that both types of development involve intricate coding, it seemed more troublesome for Nugent to adapt a picturebook to the app format than just creating stories for the app.

> **Nugent:** […] Nosy Crow and Chris Haughton[83] made the art for the app, so it was all already in photoshop layers. I was remediating a picturebook and had to slowly cut up all the art files, and patch the holes that movable objects made in the backgrounds. I had to recompose the scenes to fit the 4 x 3 ratio of the ipad [sic] which is much different that [sic] the book. In an app there is no 2-page spread or gutter – everything has to fit on one 4 x 3 space if you want to make sure that the words are always on the screen. (Personal email, 15 May 2017)

Nugent's words may have revealed a major difference between designing a picturebook and designing a narrative app. She explained further in the same email, 'Normally in children's book illustration, artwork is all in one layer, objects and backgrounds that go off the edge of the page are not finished. Backgrounds are repainted for every illustration rather than reused'. This means that when making a standard picturebook, artists do not need to produce the illustration/material that does not need to be presented to the reader, and the space occupied by each drawn element is exclusive to that element. For example, on the front cover of *Rosie's Walk* (Hutchins, 1970) (see figure 5-1), there is a fox who only has its upper half of the body shown at the left corner

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[81] My note: 'Text' here refers to signs, not textual machine.

[82] In this chapter, all the quotations in English that are from Claire Gaudriot are my translation. The original words read, 'La synergie entre toute l'équipe. Considérer chaque étape de la création comme une étape essentielle. Le texte, les illustrations, le développement, la musique, le travail des comédiens ... tout est important.'

[83] Haughton is the author of the award-winning app *Hat Monkey* (2014/2016). This is my note.

of the front cover. His body obstructs some part of the green bush (or field) in the background. If the fox is taken out of the picture, its figure will still be incomplete (although a complete image of the fox may reside in the interpreter's imagination). As for the cover page, with the removal of the fox, what appears on the picture will be a hole instead of the part of the bush (or field) previously blocked by the fox.

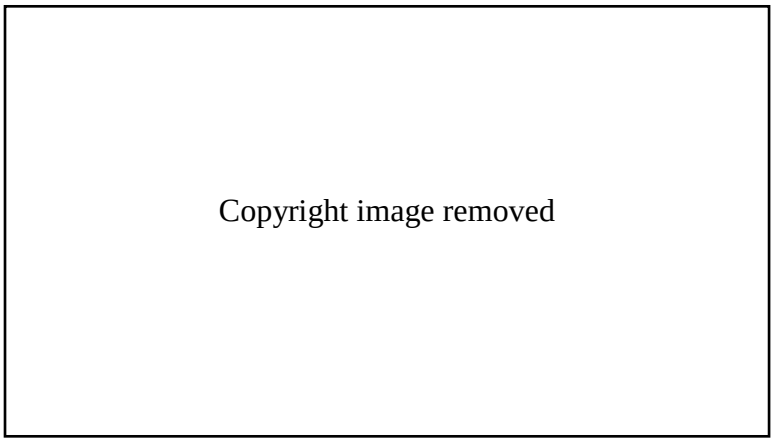

Figure 5-1: Front cover page of the picturebook *Rosie's Walk* (Hutchins, 1970).

In contrast, when designing a narrative app, the artist usually needs to design everything separately and in complete forms with layers (even though in a scene, some part of the designed objects may not be seen due to the obstruction of other objects). Meanwhile, the background of each scene, as Nugent pointed out in her email, 'needs to be continuous, large, and separate from the objects in front of it' (Personal email, 15 May 2017). In this way, according to Nugent (Personal email, 15 May 2017) and Bryan (2013), the artists can animate the elements when necessary, use them to construct different settings for different scenes, save both their time and the app memory, and make the design cost-effective.

This way of the app design suggests that when adapting a picturebook to a narrative app (i.e. adding animated and participatory features to the app adaptation, which is different from scanning pages from the original picturebook to digitise it), the developing team may need to create more art assets than the illustrators needed to for the original picturebook. This seems to be the reason why Nugent had to put a lot of effort into layering the original art files by converting formats, cutting images and patching holes in the background of the original picturebook for the app adaptation.

Owing to the complex process, creating a narrative app can be a lengthy project. This was confirmed by both Nugent and Gaudriot in our email communication. However, Nugent suggested that having experienced programmers on board may accelerate the creating process. She told me that it took her three and a half years to make *The King's Ears* (2016/2016) as she never had any experience of making an app nor had any coding skills, and she was also doing her MA and illustrated a picturebook in that time. To show that she was not alone, Nugent gave an example of Chris Haughton's experience. According to Nugent, Haughton spent five years developing his first app *Hat Monkey* (2014/2016) with his coder neighbour while neither of them were experienced in making a narrative app and both of them worked on it in part time. However, when Fox and Sheep, a studio in Berlin who develop and distribute apps for children, took on *Hat Monkey* (2014/2016) from Haughton and his neighbour, 'they redid it to a professional standard fairly quickly' (Nugent, Personal email, 15 May 2017). Nugent also reported that it took Nosy Crow nine months to 'make one of their exceptional fairytale apps' while their team consisted of 'very experienced game developers' (ibid). For A & A, Gaudriot's number is between three to six months to finish one of their narrative apps.

These numbers might not be typical, particularly considering that Nugent and Haughton developed their first apps part-time. However, according to Nugent, in her three and a half years' time of app development period, she was able to have illustrated a picturebook. Compared with her speed in making the picturebook, the lengthy period she spent in developing the narrative app and her confusion in how to make this artefact seem to suggest that being experienced in making codex literature did not seem to help Nugent advance her development of narrative apps. In fact, as Emma Nuttall (2017), the project manager at Thames & Hudson, points out, 'being experts in literary (and print) culture in no way prepares publishers to create outstanding digital books' (n.p). This suggests that the making of the codex and the making of the narrative app may not have much in common. Moreover, the cases of different publishers and designers mentioned previously seem to reinforce the significant role of the technical aspect in creating a narrative app.

The Post-Launch Period

It has been mentioned briefly in Chapter One that once published, a codex cannot be altered in any way in this published version, but a narrative app can still be updated constantly after being released. In fact, there is no absolute finalisation of the app development in terms of its

narrative and its performance. As a piece of software, the narrative app requires constant maintenance after being launched to the app store. In the post-launch period, there are usually two tasks for the developers to do: the major version update and the minor version update.

The major version update is optional, which is to keep updating the catalysis and/or nucleus in the app by, for example, adding more features or even more storylines. For instance, *The Cat in the Hat* (2010/2010) once had an update where the designers added rain effect to the app. *Wuwu & Co.* (2014/2017) was added with Danish language option in the version 1.8.

The minor version update is mandatory, which is to keep the narrative app operational by fixing bugs or making the app compatible with its target operating systems such as iOS and Android. As these systems are always being updated, the narrative app, being a piece of software, must be updated as well to be operational in these computer systems.

The Design Concepts

The Criteria

In the previous chapter, I proposed a list of criteria for a quality narrative app. These criteria basically address the integral level of different features (such as sound and hotspots) for the storytelling. From a publisher's perspective, Gaudriot, Nugent and O'Connell expressed similar ideas that mostly echo my criteria. They believe that to make a quality narrative app, developing teams should try to integrate every component of the app in harmony, and everything should be designed in a way to enhance the narrative. For example, when asked about the function of the hotspots in A & A's apps, Gaudriot answered in her email, 'They enrich the story without distorting it. They bring poetry, fantasy and laughter'[84]. She specifically commented that A & A had games in their apps 'from time to time, but they must never interfere with the narrative'[85] (Gaudriot, Personal email, 1 March 2016).

As for Nugent, she offered very specific criteria that she considered necessary for a quality narrative app:

[84] 'Elles viennent enrichir l'histoire sans la dénaturer. Elles amènent de la poésie, de la fantaisie, du rire.'

[85] 'Il y a de temps en temps des jeux, mais ils ne doivent jamais gêner le récit.'

> **Nugent:** Creating integral sounds, animations and interactions which are not redundant is the central challenge of designing a great story app[.] It means racking your brains to figure out how you can say something essential or enriching in a mode other than words and pictures, and having the freedom to cut words and pictures to avoid redundancy. Everything that makes a good picturebook should be present: a well-written, rich story and beautiful artwork, beautiful graphic design. The app should have smoothly functioning user interface and navigation. Children need to be able [to] move backwards and forwards, repeat everything they want to re-examine, start and stop at will. It should also have integral (intrinsic) sounds, animations, and interactions. Sounds should be created by professionals and professionally recorded. Animation should be child-controlled and repeatable sprite animation, not embedded video. (Personal email, 15 May 2017)

Nugent's criteria seem to cover two aspects: the integrity of all the elements in the app, which I discussed in the previous chapter, and the functionality of the app, which was not in my criteria list. However, from a practical perspective, I agree with Nugent that functionality of the narrative app should be used as an important criterion for app evaluation, especially as previously discussed in this chapter, the narrativity of the narrative app rely on each and every step of the making process. If a narrative app has beautiful graphic design and a theoretically good story, but if it is not functional or does not perform well on the computer, the app's narrative delivery will be ruined. In other words, the functionality of the narrative app can be a vital constituent of the app narrativity.

Moreover, in their email responses, Gaudriot and Nugent appear to share a strong sense of disagreement with the conduct of offering excessive 'hints' for children in the narrative app. Gaudriot wrote that it was their approach not to give hints to participatory features in their apps[86]. When asked if A & A were worried about children not being able to explore all the participatory features, Gaudriot wrote, 'No. We like our stories and all their interactions to be discovered at the 3rd or 4th reading. Children are happy to discover these surprises after several readings. It's like bonus'[87] (Personal email, 1 March 2016). Gaudriot's answer suggests that her team expect children to 'read' their apps more than once. It also reflects her team's respect to children's intelligence and their confidence in children's ability. This respect and confidence was presented again in her response to my question of what they looked for in the testing phase.

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[86] 'Nous ne signalons pas les interactions, c'est notre parti pris.' (We do not signal interactions. That is our approach.)

[87] 'Non, nous aimons que nos histoires et toutes leurs interactions soient découvertes à la 3e ou 4e lecture. Les enfants sont contents de découvrir ces surprises après plusieurs lectures, c'est comme un bonus !'

> **Gaudriot:** We let children be caught up in the story and not bother with interactions. They find the interactions but not necessarily the first time. We observe them, and we are generally happy because they forget quickly about 'tapping' all over the screen. […] If the child finds them [i.e. the participatory features], great, but if s/he misses it, it does not matter. S/He will find them in a future reading[88]. (ibid)

Nugent told me that she did a classroom testing with 30 children aged 7. She directed me to her blog (Nugent, 2017) where she reported and discussed the testing. Based on her findings, it seems that those children were very capable of identifying the hotspots and succeeding in triggering them with the intended methods. From her testing, she found that the children might explore the narrative app in many ways similar to the ways they would explore the picturebook. Such ways are identified by Nugent as 'repetitive, exploratory, experimental, speculative, deductive, and hermeneutic' ways. Additionally, Nugent points out in her report that excessive hints might suggest 'a lack of logical interconnection between the narrative contributions to the story made by each modes of words, pictures, sound, animation and interaction on each screen'(Nugent, 2017, n.p.). This point of hers seems to indicate that as long as that the app narrative has interrelated nucleus and catalysis, no matter whether they are already presented in the scene or they need to be revealed by the interpreter, the children would be capable of finding them. This seems to reinforce the importance of having a coherent story with interrelated discourse in the app design.

Ludic Features

Although every feature in the narrative app should prioritise the narrative, the ludic feature seems to be controversial. The ludic feature is part of participatory/interactive features in the narrative app. As the name suggests, the ludic feature contains playful aspects. For example, in Chapter Four, I described a series of playful hotspots from NS1 to NS7 in the app *Lil' Red* (2012/2013), such as that in NS3 where interpreters can tap the pinecones to make them fall. For another example, in *Lessmore* (2011/2015), there is a scene where interpreters can swipe the house to let it spin in the wind. These playful hotspots are all cases of ludic features.

It may be useful to compare two concepts here, the narrative app with ludic features, and the

[88] 'Qu'ils soient pris par l'histoire et pas gêner par les interactions. Qu'ils trouvent les interactions mais pas forcément du premier coup. On les observe, on est généralement content car ils oublient vite de « taper » partout sur l'écran. […] L'enfant les trouve c'est super, si il passe à côté ce n'est pas grave, il les trouvera lors d'une prochaine lecture.'

game app based on a narrative. The latter is usually seen in the type of adventure game[89] where the game world is built in a story world. To play the game, interpreters usually need to travel through (sometimes back and forth in) the game/story world, completing tasks while creating narratives. For example, in Chapter One, I introduced an adventure game app called *Machinarium*. In this game, the interpreter plays the role of a robot who has various adventures ahead of him. To proceed with his adventure, the interpreter needs to solve all sorts of puzzles. This type of game apps can be very similar to narrative apps in many aspects. For example, they are both playful and narrative, and both are capable of offering aesthetic and literary pleasures to interpreters. However, there still seems to be a fundamental difference between them, that is, the functions of the narrative and the ludic features in the app.

For game apps, the narrative, no matter how well constructed or blended in the game world, seems to be mostly used to engage interpreters in the game. As Miller wrote in his email when asked about the function of the narrative in Kuato Studios' games, 'Within a game environment, story should be embedded within the learning design as much as being a driver for continued engagement' (Personal email, 12 May 2016). On the other hand, when the interpreter traverses in the game/story world, s/he is often consciously familiarising her/himself with the rules of the game, abiding by the rules while looking for tasks to complete and goals to fulfil. Thus, for a game (app), the progression of its narrative usually depends on the completion of tasks. As Adams (2014) points out that 'a goal […] and rules' are essential to a game (p.3), while Luesebrink (2001) specifies that a game 'has as its outcome a win/lose, black/white result' (n.p.). In other words, it may be understood that for a game app, the narrative may not be necessary, but the play is.

For narrative apps, however, most of the ludic features are designed to assist the development of the narrative, embellish the narrative or a break from the narrative. These ludic features generally are not designed as obstacles standing in between the narrative development and the interpreter. Specifically, even though sometimes ludic features may be presented as games, it is not necessary for the interpreter to participate in the play or win the game in order to proceed with the narrative. In fact, strictly speaking, many ludic features in narrative apps, such as those in *Lil' Red* (2012/2013) app, are not really games that have specific rules to play. In other words, for narrative apps, the play may not be necessary, but the narrative is. Narrative apps with

[89] This does not mean that adventure game is the only type of games that are based on narratives.

playful aspects do not make them game apps.

However, this comparison between narrative apps and game apps is by no means to suggest that narrative apps cannot be playful or entertaining, nor to say that game apps cannot afford (quality) storytelling. In fact, nowadays, there are many game developing companies pursuing quality narrative designs for their adventure games, which mingle the game world with the story world, and blurs the borderline between games and narrative.

That being said, the differences between the narrative app and the game app do not seem to be widely recognised in the public domain. Nugent suggested in her email that there were some people (including reviewers) who considered the ludic feature in the narrative app as the 'terrible thing – a diversion' from the story, which to her is 'the worst kind of insult in story app criticism' (Personal email. 15 May 2017). When asked about her opinions about ludic features in narrative apps, Nugent wrote a two-page response, the longest answer given to my questions, in which, she argued why ludic features should not be considered diversions.

It must be pointed out that the ludic features that Nugent argued for are those, in her words, 'thematically related' to the narrative, not those that are 'cosmetically tied to the themes of the story' and thus isolate the play from the narrative (ibid). With this premise, she raised three interesting points to support ludic features in narrative apps.

Firstly, extended from the picturebook theory of 'playfulness' from Nodelman (1988) and Mackey (2007), Nugent pointed out that narrative apps, like picturebooks, are 'essentially ludic'. To her, children's engagement with the ludic features in the narrative app is a playful way of interpreting the narrative because by discovering these features in the app, and by figuring out how they work and how they are related to other features and to the rest of the narrative, children are discovering meaning through solving 'puzzles'. This point corresponds with my case study of *Lil' Red* (2012/2013) app in Chapter Four. It was argued that the playful hotspots in the catalysis-NSs are necessary for atmosphere building, and they prepare interpreters for a dramatic turning point of the narrative. In other words, these ludic features in the *Lil' Red* (2012/2013) app do not divert children from the narrative, but instead help them to make sense of the story.

Secondly, Nugent believed that engaging body in play is natural and important to children to comprehend the world around them. She specifically pointed out,

> I believe engaging the body activates the mind. I think people who want to disable interaction while the narration is playing are puritanical, distrust play and the body, and don't understand the body's role in learning and creativity. (Nugent, Personal email. 15 May 2017)

As an educator, Miller's response to my questions corresponds with Nugent's idea. When talking about play and learning, Miller responded:

> Every time a child plays, whether in the garden with sticks and leaves, or on the bedroom floor with Lego and toys, they are naturally creating stories, evolving to take in new objects or situations. (Personal email, 12 May 2016)

Nugent and Miller both believed that children learn and create through play, and while playing, they engage their full body, if necessary, to help the brain process the information. Schwebs (2014) expresses a similar view in his examination of *Lessmore* (2011/2015). He suggests that '[f]inger gestures produce and display meaning, thereby enabling the user to sense and understand' (p.9). It thus may be deduced that the ludic feature in narrative apps, such as asking children to blow to the microphone, to shake the tablet, and to hold the tablet to turn around, may be taken as a tool for children to comprehend the narrative. In fact, Nugent reported that in her classroom testing for *The King's Ears* (2016/2016) app, she found that the 'integral playing strengthened the children's connection to the story, and while they played, they seldom deviated from discussing what they were doing in terms of the story' (Nugent, 2017, n.p.).

Moreover, as previously mentioned, Gaudriot noticed that her child testers forgot very quickly to tap all over the screen while traversing the narrative. This is an interesting finding. On the one hand, it shows that these children could become immersed in the narrative even if it was told using multimedia. On the other hand, it shows that these children did not seem to have trouble comprehending the narrative without the information behind the hotspots. Considering that most of ludic features in A & A's apps are catalysis-hotspots, that is, they are not necessary information for comprehending the logic of the narrative, A & A's test finding may suggest that these children might have indeed treated the hotspots in A & A's apps as comprehension tools.

Thirdly, Nugent raised a compelling point, stating that she believed that a narrative app with narrative related ludic features mirrors the way of life.

> **Nugent:** I would say to people who object to stopping to play with an integral story interaction that life has tangents and stopping points and for periods of time to learn, play, rest, and turn your focus from your own life to someone/thing else. It makes perfect sense to me that a story app would have these same elements. (Personal email. 15 May 2017)

These words of Nugent's are significant because they help to justify the capability of the narrative app – the narrative app is capable of presenting literary works that are inspired by life and mimic life. Like Nugent, Gaudriot made it more explicit in her responding email that she considered her company's apps as 'books' (i.e. literature), not in the sense of presentation, but in the sense of literary value. She wrote, 'when you close the app, you keep thinking about it, dreaming about it like when you close a book. Our apps tickle the imagination, read it and read it like a book[90]' (Personal email, 1 March 2016).

The Narrative App being Literature

The intricacy of the narrative app being literature emphasised by Nugent and Gaudriot is, in fact, much less examined academically than its educational aspects. Being part of children's literature, the narrative app deserves and requires a detailed literary analysis. To offer a demonstration of how to analyse a narrative app under literature lens, I will hereafter use *Pierrot Pierrette* (2015/2015) to serve as an example.

The story *Pierrot Pierrette* (2015/2015) app is written and illustrated by Nicolas Gouny, co-designed and published by A & A. It tells a story of two children, Pierrot and Pierrette. Pierrette was ill from being sad. According to the doctor, there was only one cure for this, a moonflower. To cure Pierrette, Pierrot embarked on an adventure of searching for the moonflower. He travelled to the moon on a shooting star but did not find any. After reading a book in a moon library, he found out that to get a moonflower, he had to plant a star. Despite various frustrations and hardships, Pierrot succeeded in the end. The moonflower turned out to be a red flower in the shape of heart. The story ends like this:

[90] 'La lecture avant tout. Il y a un début et une fin, quand on ferme l'app, on continue d'y penser, d'y rêver comme quand on ferme un livre. Nos apps titillent l'imagination, on les lit et les relit comme un livre.'

Together they climb a hill. Pierrot and Pierrette look up at the night sky and Pierrette whispers in his ear: 'Look, Pierrot, a shooting star… Let's make a wish.' Little does Pierrette know that Pierrot's wish has already come true. (see figure 5-2)

Figure 5-2: Screenshot of the last NS in *Pierrot Pierrette* (2015/2015).

This is a beautifully designed story with sophisticated language and whimsical ideas. Using black water colour as the dominant colour in the visual narrative accompanying white/greyish negative space, Gouny creates a state of a dreamy world which echoes the fictional theme of the story. Occasionally, he also throws some small bright colours here and there in the scenes, which adds a sense of contrast to the narrative. What I find significant about this narrative app is its ability to allow its interpreters to travel smoothly back and forth across two realms, reality and fantasy.

It is arguable that this story depicts two worlds of Pierrot, a physical world where he is with Pierrette, and a mental world where he is desperately looking for a cure. Thus, Pierrot's journey of searching for the moonflower on the moon, planting the seed and finally getting the cure for Pierrette can be regarded as a metaphor for his psychological development – how he grows to be helpful to Pierrette and finally helps her out of her sadness. The participatory features in this app are also highly metaphorical, which helps the story to deliver several important themes, such as perseverance, faith and love. However, what I was impressed with is a less cheerful yet

very important theme I detected from the app, that is, the concern of mental health, particularly depression. Specifically, the app seems to address the theme of mental health of children's and/or adults' by depicting the difficult situation experienced by Pierrette and her significant other.

The app has a striking opening scene (NS1), that has only three lines:

> Pierrot is worried.
> Pierrette is sad.
> Sadness is no ordinary disease (see figure 5-3).

The verbal description sets up a melancholic tone for this scene. The soft background music continues to build a gloomy atmosphere. If the interpreter chooses 'listen to the story' option to traverse the material, s/he will hear a gentle female voice slowly read out the words. The actress's vocal performance is professional and dramatic, which contributes to the building of the atmosphere. The illustration of NS1 is largely dependent on the solid black water colour against the white negative space. The black moon and stars, the black sheet and the black floor/ground are all capable of sending a sense of intensity, worry and perhaps despair, which is consistent with the mood created by the words and auditory elements.

Figure 5-3: Screenshot of NS1 in *Pierrot Pierrette* (2015/2015).

Interestingly, Pierrette is declared to be sad without any reason. Being melancholic without a specific reason is exactly a symptom of depression. It is not certain though if this is the author's intention to imply that Pierrette is depressed. However, the beauty of literature is that it gives freedom to the interpreter to imagine based on collected 'evidence'. Thus, based on the visual, verbal and auditory narrative, it is arguable that Pierrette is suffering from depression.

There is also an ingenious design of a participatory feature in this scene that may reinforce the gloomy tone. In NS1, all the stars can be moved around. They can also be moved away totally from the sky by being dragged and dropped to any other objects or characters that contain black colour. For example, one can drag the stars and drop them to the black sheet covering Pierrette, to the black floor/ground, to the black moon, or to the black hair of Pierrot or Pierrette. Once dropped, these stars will immerse in the darkness and thereafter disappear from the scene. The starless sky is a big negative space that creates a sense of emptiness. This emptiness can be interpreted as an exemplification of Pierrot's anxiety, helplessness and fear, especially the fear of a world without Pierrette. Thus, when the interpreter is removing all the stars from the sky, s/he is contributing to the building of the intense atmosphere.

It is necessary to point out that most of the NSs in this app portray a starry sky. However, this opening scene is the only one that allows the interpreter to empty the sky by moving away the stars. It thus can be considered that this design could be done on purpose to contribute to the narrative development. No matter purposefully designed or not, it can be anticipated that by playing with the stars, the interpreter is offered an opportunity to further the narrative, and perhaps to feel the feelings of the protagonists and empathise with them.

It is interesting that the author does not specify the relationship between Pierrot and Pierrette. It thus allows various interpretations. Based on the visual and verbal indications of their intimacy, they can be interpreted as friends, brother and sister, or even a couple that are playfully depicted in the images of children. In whichever case, using Pierrot and Pierrette, Gouny has depicted a very realistic picture of how people may respond to their significant others when the latter are possibly suffering from depression.

Figure 5-4: Screenshot of NS2 in *Pierrot Pierrette* (2015/2015).

According to the depiction, Pierrot's responses towards Pierrette's illness has been through several stages. NS1 portrays a direct response of Pierrot upon knowing Pierrette's illness: he is worried. In NS2 (see figure 5-4), Pierrot has sought for medical advice, which, in a realistic setting, can be a natural response of people who have little experience in treating depression. To create a concept of 'moonflower' as the cure of sadness, Gouny seems to acknowledge that it is tricky to deal with mental health issues, and that solely using medical solution may not be effective or ideal for curing this type of illness. In fact, by drawing the moonflower in the shape of heart in the latter scenes, Gouny seems to suggest that a useful way to help people who are suffering from mental health issues is perhaps to accompany them with patience, support and love.

In his journey to searching for the moonflower, Pierrot is shown to have experienced several emotional ups and downs. NS3 and NS4 depict his resolution to find the moonflower when he has just embarked on the journey. NS5 suggests his first self-doubt about whether he can succeed or not. In NS6 and NS7, he regains hope after finding a book that says a moonflower can be grown by planting a star. However, in NS8, Pierrot seems to have had an emotional break down. It says in this scene:

Pierrot plants a star.

Then waits…
And waits.
But, nothing happens.
Nothing at all. (see figure 5-5)

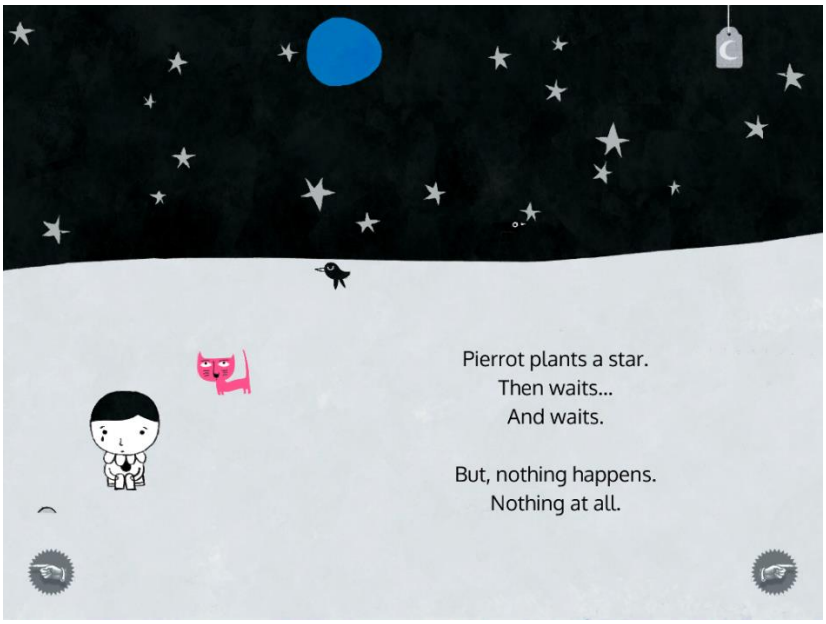


Figure 5-5: Screenshot of NS8 in *Pierrot Pierrette* (2015/2015).

In this scene, Pierrot is portrayed sitting sadly in front of a rounded pile. His 'faithful friends', the pink cat and two black birds are playing with each other around him. The fun they are having is a sharp contrast to Pierrot's despair, which seems to suggest the different responses of insiders and outsiders in the case of depression. In fact, the roles that the cat and the birds play in this app may afford several interpretations. In this demonstration, it is believed that the animals may be the imaginary friends of Pierrot, a way to cope with harsh reality, which may explain why the animals always appear to be happy and energetic. Moreover, the cat was given an outstanding colour in the app, which is intriguing and may worth exploring. However, considering that Gouny has a beloved cat of his own, this cat may be perceived simply as an exemplification of the author's playfulness.

Furthermore, this scene has a similar design with NS1, that is, the interpreter can drag and drop the star to the rounded pile to plant the star. However, there is a distinctive difference between the two scenes. In NS8, the interpreter can never empty the sky. In fact, whenever a star is dragged away from the sky to be planted in the rounded pile, a new star will appear in the sky. This endless appearance of the stars corresponds with the atmosphere of the scene, and

reflects Pierrot's frustration. From NS9 to the end, the narrative becomes more and more cheerful because Pierrot has finally succeeded in getting the moonflower and saved Pierrette from sadness.

In terms of the theme of depression, this app reflects a perspective that is not often seen in the literary works dealing with the same theme. Instead of depicting the world of the depressed one, the app's narrative focuses on portraying the party who is the witness of his beloved one suffering from depression. On the one hand, this is a helpful perspective for those who are suffering from mental health issues to understand the feelings of their friends and families, and to feel being supported and loved. On the other hand, it may help those who have not had much experience in dealing with depression to understand what it means to be depressed and how to support the depressed people. The app seems to deliver a message that it is not easy to fight against mental health issues, but it is achievable with faith, support and love.

There are certainly other possible interpretations of the story. My analysis just serves as one possibility. There are many other narrative apps, such as *Spot* (2015/2015), *With A Few Bricks* (2015/2016), and *The Poppin Princess* (2013/2013), that exemplify significant literary merit that may be studied in the same way as proposed by this study. Specifically, a literary study of the narrative app may consider the following questions:

- What is the story?
- How the story is told?
- How many kinds of elements (e.g. verbal, visual, auditory, participatory and interactive elements) are there in the narrative app?
- How do these elements contribute to the theme of the story respectively and collaboratively?

Challenges

The complex process of making a quality narrative app indicates various challenges that may be faced by the app development teams. Some of these challenges may be familiar to the codex publishing, but some of them seem to be exclusive to the digital publishing. These obstacles sometimes can be vital factors that prevent the development of a (quality) narrative app. Based

on my data, two common challenges are identified:

- technical barriers,
- financial difficulties.

Technical Barriers

Ideally, a good narrative app should be a perfect integration of the storytelling and the programming. However, in reality, this is not easy to achieve. There are many issues that the developers need to work on to enable a smooth storytelling.

A common but vital technical issue faced by the app developers are 'bugs' which are also seen in computer games and other software. As is commonly known, a software bug is an error or flaw in a computer programme (or system) that causes its malfunction. Most software bugs in narrative apps arise from human errors occurring during the software design. Software bugs do not exist in printed books. In printed books, what one may encounter that might be similar to bugs are perhaps typographical errors which may be corrected when the book is reprinted. Although bugs can be fixed too by minor or major version updates, what they may affect in the app storytelling (before being fixed) is more severe than what typographical errors may do to the codex. Specifically, bugs can seriously disturb the narrative delivery and the traversal experience of the interpreter. In some disastrous cases, bugs even prevent the narrative development.

For example, while testing Nosy Crow's *Snow White* (2015/2017) app, I encountered a bug that caused the app to automatically shift scenes. This happened if I did not touch anywhere on my tablet screen after the navigation button being highlighted for three times[91]. There is a piece of information that needs to be provided. Nosy Crow's apps are usually programmed to be able to detect whether interpreters have obtained enough information from a scene. If they have not, the software will use a blinking blue dot to highlight the parts where the information is hidden. When the software detects that interpreters have gathered the necessary information to move on, it will let a blue arrow (the navigation button) jump at the bottom right of the scene to suggest interpreters tap it and move to the next scene, but interpreters are allowed to ignore the jumpy

[91] My testing experience was recorded and uploaded on YouTube for Nosy Crow to check. The YouTube link is: https://www.youtube.com/watch?v=OMEZaHxNOY0

blue arrow. They are free to stay at any scene at will, and explore more of the scene at their own pace.

That being said, when traversing the *Snow White* (2015/2017) app, I was not allowed to stay in any scene any longer once the app detected that its interpreter had gathered the necessary information to move on. What happened was that the following scene was brought forward automatically after the blue arrow blinked three times for the previous scene. This situation occurred repeatedly and sometimes, the scene was changed *during* a speech of a certain character. This malfunction of the app appeared to be disturbing to my exploration of the app as it happened unexpectedly. After the pattern of the problem became obvious, my exploration was continued with me being alarmed. Lacking the knowledge about what was expected to be 'enough information' for the interpreter to move on, I could not help but constantly divert my attention to the blue arrow, which, admittedly, affected my appreciation of the narrative and the aesthetic merits of the app. Meanwhile, lacking control of the pace of the narrative flow gave me a sense of frustration and powerlessness. My traversal experience was broken overall.

For another example, *Heart and Bottle* (2010/2010) was found with bugs by some customers. The bugs had caused serious broken images in some scenes, which had become an aesthetic/narrative defect of the app (see figure 5-6).

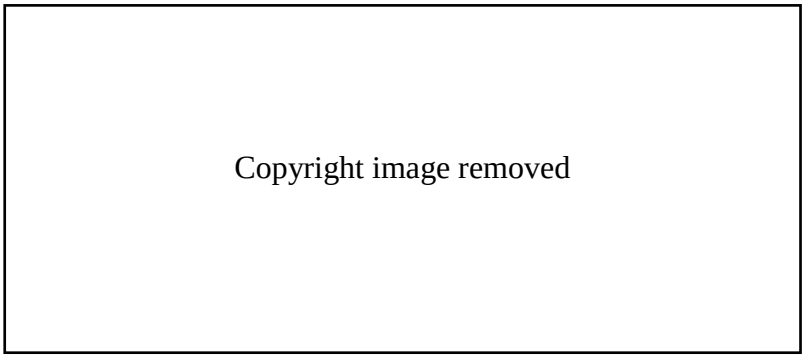


Figure 5-6: Two screenshots of an NS in *Heart and Bottle* (2010/2010). The screenshot on the left is what is supposed to appear in this NS. The screenshot on the right, however, is what the scene looked like on my iPad when there was a glitch.

Although I am an adult interpreter whose expectations and responses may be different from a child interpreter, it might be nevertheless interesting for the future research to explore children's responses to narrative app bugs. The researchers might be interested to study, for

example, whether bugs may affect children's curiosity of the narrative, their perceptions of the narrative, and their evaluation of the app's narrativity and its entertaining level.

Apart from the malfunction of the app, some coding design might potentially affect the logic of the narrative. Using Nosy Crow's apps for example, the blue blinking dot is a consistent design in Nosy Crow's apps to aid interpreters to fully explore the narrative content. When there are multiple characters in a scene, this blue dot seems to usually appear on the character that is supposed to speak the first, and then it will move on to appear on the next supposed-to-be speaker until all the characters have exhausted their speech textons accordingly. The sequence of the blue dot's movement seems to suggest that there is an intended way for the narrative development. However, this 'intended way' is not compulsory. That is to say, if the interpreter ignores the indicated order by the blue dot, and acts at will, the app will not prevent this from happening.

On the one hand, this type of coding empowers interpreters who can organise the narrative content in their preferred order so as to create a narrative that is fun and personal to them. It may also increase the entertaining level of the apps as repeated exploration may still bring the interpreter something different. On the other hand, however, this coding design may have a potential defect because when interpreters click on characters out of sequence, they may create illogical narratives such as incomprehensible conversations.

For example, in the app *Cinderella* (2011/2016), there is a scene where interpreters are supposed to help Cinderella do the housework. The intended narrative development seems to be as follows: Cinderella will ask for help from the interpreter who will do the chores for her, and during the housekeeping, the two sisters, apart from being self-admiring, will complain about Cinderella being slow or making too much noise. In the real setting, however, there are chances that some interpreters may tap the two sisters before helping Cinderella. In this situation, Cinderella will be standing still in the scene, but one of the sisters may complain 'You are making too much noise Cinderella!'. What the sister says contradicts what is happening. Logically, this could be a defect of the app, although empirically speaking, more studies are needed to investigate whether the child interpreter may find the situation problematic. It may also be worth exploring whether illogical narrative affects children's development, and if so, to what degree. In whichever case, Nosy Crow's case seems to suggest that it can be challenging

for the development team to balance between two kinds of degrees: the degree of the logic of the narrative, and the degree of control that interpreters can have on the narrative.

Financial Difficulties

Although the coding design might be challenging, a good design is not unachievable as long as there are sufficient funds. However, according to Nugent and Gaudriot, developing, advertising and maintaining a narrative app can be costly:

> **Nugent:** Making an app is very expensive because it is time-consuming and requires a number of expertises [sic]. Michael Katz of Tradewind Books told me that creating a codex picturebook with a print run of 3000 books costs about $30,000 [Canadian dollars]. For an app you would need to add the costs of play design, graphic design, animation, sound design, narration, programming, and marketing. (Personal email, 15 May 2017)

Gaudriot who has rich experience in narrative app publishing had the same understanding as Nugent. She sadly admitted that lacking the budget for marketing was a reason that had caused disappointing sale of her apps.

> **Gaudriot:** Before, I thought only quality was important. I relied on word of mouth, being confident of the quality of our apps. But it was very pretentious. Today only the marketing counts. It must integrate it with the conception of the app. Thus, it's a huge budget[92]. (Personal email, 1 March 2016)

Nugent's and Gaudriot's words may be another reminder to the app researchers that the narrative app is, above all, a commercial product. As a commercial product, its survival and development may largely rely on the sales performance. Financial success means more budget to improve the app product and to make future plans for more apps, as is seen in the growth of Nosy Crow. This means no profit or unsatisfying financial gain may terminate the development of a particular app. As software, if the narrative app's development (such as software updating) has ceased, it may have vital impact on its narrativity and other aspects, which is different from what may be expected from codex publishing.

For example, Gaudriot specifically pointed out that '[t]he hardest part [in creating a narrative

[92] 'Je pensais avant que seule la qualité était importante. Je comptais sur le bouche à oreille, sûre de la qualité de nos apps. Mais c'était bien prétentieux. Aujourd'hui seul le marketing compte, il faut l'intégrer dès la conception de l'app. C'est donc au final un budget faramineux.'

app] is making endless updates to be compatible with Google Play, the AppStore … and with all tablet formats'[93], which requires strong financial backup (Personal email, 1 March 2016).

As maintaining a narrative app is not free, most publishers tend to ignore the post-launch development for their products when they see no profit from updating them. However, when the maintenance is ceased, poor performance of the apps may occur. For example, when A & A withdrew from the narrative app business in 2016, they stopped maintaining their products. As a result, one of their apps, *The Poppin Princess* (2013/2013) appears to be incompatible with the latest Android system for Google Nexus tablets. The app will shut down suddenly after running for a few scenes. One of Harper Collins' apps, *Heart and Bottle* (2010/2010) has not been updated since version 1.0. Thus, it still contains the unfixed bugs described in figure 5-6.

Following this commercial perspective, a tight budget might reduce the number of potential customers, which, in return, might lead to dissatisfying sales performance of the narrative app. For example, when I was collaborating with A & A to make *The Great Ghost Chase* (2014/2014) app, I found that the app did not contain any vocal narration, which later appeared to be something picked on by some app reviewers[94]. When I expressed my concern about the narration to Gaudriot, she explained that there were two reasons for this decision. The primary reason was, this app was developed for children who can read. They expected children to 'read' the app like they read books, to be immersed in the reading and to reflect upon the reading before exploring the participatory features. The second reason was that they could not afford dubbing actors due to a limited budget. Gaudriot's explanation suggests that lacking financial support had left fewer options for A & A to make an app that might appeal to a larger variety of customers. With a vocal narration option, the app could have given more freedom to interpreters (not necessarily children) to decide in which way they want to traverse the text. It could also have been suitable and appealing to interpreters who are struggling readers or who cannot read.

When asked about whether the narrative and the aesthetic values of an app are related to the funds available, Nugent and Gaudriot offered some interesting answers. In spite of her

[93] Her original words are: 'Le développement – très long donc très cher. Le plus difficile est de faire les mises à jour sans fin pour être compatible avec Google Play, l'AppStore... et avec tous les formats de tablettes.'

[94] For example, Appysmarts.com listed 'no narration' in one of the two things that they did not like about this app. The other thing was 'not easy to use (we recommend parental assistance)'. In spite of this, they offered a score of 99/100 to the app. (http://www.appysmarts.com/application/the-great-ghost-chase,id_103915.php accessed on 14 July 2017).

experience with developing *The King's Ears* (2016/2016) app, where Nugent's proposed hotspot design was refused by the first sponsor who regarded the idea too expensive, Nugent believed that '[s]omething can be technically simple, but aesthetically beautiful and profound' (Personal email, 15 May 2017). In other words, Nugent seemed to suggest that the technical design of a quality narrative app did not have to be complicated. However, Gaudriot held a different opinion.

Unlike her concise answers to most of my questions, Gaudriot wrote a relatively long response to explain why she thought the quality of a narrative app was related to the funds available. The length of her answer suggests that she could be more emotional at answering this question than she was for some other questions, which might indicate that the issue with funds in the making of their apps could have had great impact on A & A. Gaudriot's answer is very interesting, so here it is quoted in full for further analysis:

> **Gaudriot:** We do not want to take children for fools and the quality of the story is of paramount importance. We work with authors on original texts [i.e. stories], which has a cost. This cost is not the most important in the creation of the app. I would say that its impact is less in the overall cost of the application. However, for the application to be consistent with the text [i.e. verbal signs] and the illustrations, we get quite a lot of developers involved in the creation. This cost is very important.
>
> So yes, for A & A, the quality of our applications depends on the funds invested.
> That said, I saw very nice apps developed with barely any money, where the author was both the illustrator and the developer. I guess its application cost a lot less for a quality equivalent to our applications.
> I think the quality of each application depends on the time it takes to make it.
> …And as time is money… My answer will eventually be yes![95] (Personal email, 1 March 2016)

[95] 'Nous ne voulons pas prendre les enfants pour des imbéciles et la qualité de l'histoire est primordiale. Nous travaillons avec des auteurs sur des textes originaux, cela a un coût. Ce coût n'est pas le plus important dans la création. Je dirais que son impact est moindre dans le cout global de l'application. Cependant pour que l'application soit cohérente avec le texte est les illustrations, nous impliquons énormément les développeurs dans la création. Ce cout est très important. Donc oui pour A&A la qualité de nos applications dépend des fonds investis.
Cela dit j'ai vu de très belles apps développées avec "3 francs 6 sous", où l'auteur était à la fois l'illustrateur et le développeur. J'imagine que son application a coûté beaucoup moins chère pour une qualité équivalente à nos applications. Je pense que la qualité de chaque application dépend du temps passé à sa création... Et comme le temps c'est de l'argent... Ma réponse sera finalement oui !'

Gaudriot's answer reflects a few interesting thoughts of hers. Firstly, she seems to suggest that the narrative and aesthetic quality of a narrative app is twofold which requires both good quality of the narrative design and the consistent quality of the programming. Good quality of the narrative design for A & A means that the story must be original and be created *for* tablet computers. This pursuit of originality does not seem to be exclusive to A & A, but is seen in the conduct of many other French app publishers. For example, La Souris Qui Raconte is a French children's publishing company that make and publish both codices and digital children's literature. So far, they have developed ten narrative apps, all of which are based on original stories. E-Toiles Éditions is another French digital children's publishing company who are also keen on originality. Their app *In My Dream* (2014/2012) set up an excellent example of how to tell a story on a touchscreen in the early days of narrative app development. It therefore won both BolognaRagazzi Digital Award and Editor's Choice Award from Children's Technology Review for excellence in design in 2012.

The philosophy of the narrative app development team could be a drive to make innovative apps, but it could also impose financial pressures and frustrations to the team. This means financial resources may be decisive factors for the creative freedom of the app makers.

Secondly, Gaudriot's answer suggests that A & A considered the programming as an inseparable constituent of the app. In other words, for A & A, the programming seems to be a type of narrative content, which echoes Nosy Crow's philosophy discussed previously. In contrast, Nugent seemed to treat (perhaps unconsciously) the technical aspect of the narrative app as a complimentary feature of the storytelling. Although she mentioned in her answers to other questions that the technical side should be integrated into the storytelling, she did not seem to consider this feature of the app as a type of narrative. Instead, Nugent seemed to treat it as a platform to present her story.

From her choice of words, i.e. referring to the narrative app as the picturebook app in her dissertation (Nugent, 2016) and occasionally in some of her responses to my questions, it seems that for Nugent, the concept of a 'picturebook' is central to her design of the narrative app. In fact, she frequently mentioned in her email responses about how she developed the app based on the picturebook scholarship from Margret Mackey and Perry Nodelman. Thus, it seems that for Nugent, the narrative app is, first of all, something close to the picturebook, or even a type of the picturebook, while for Gaudriot and Nosy Crow, it is more like a piece of software that

can tell stories.

Gaudriot's and Nugent's responses may suggest that they do not share the same opinion on the role of the technical aspect in the making of the narrative app. This divergence may be a result of their backgrounds. Specifically, although both are artists, Gaudriot is used to creating stories with various materials, such as sculptures, picturebooks and apps, while Nugent was committed to writing and illustrating children's books before embarking on her first app development. From this perspective, Gaudriot might have appeared less preoccupied than Nugent by a certain way of storytelling. Meanwhile, Gaudriot's team developed their own stories for the apps to tell, while Nugent's first app opportunity was to remediate a picturebook. In this way, Gaudriot's team might have been less restrained than Nugent in using a tablet computer to tell a story. In addition, when facing the computer technology, Gaudriot seemed to be interested in exploring its potentials for some innovative and brand-new storytelling as she wrote in her email, 'I believe in a new reading. I think that everything is yet to be invented'[96], while Nugent, on the other hand, appeared to be more interested (perhaps unconsciously) in exploring its potentials for helping picturebooks evolved in the digital age.

Although both views of the artists are acceptable, and both are good at creating quality narrative, they are very likely to lead to different forms of digital storytelling, perhaps one (e.g. Gaudriot's) being remote from the picturebook format while the other (e.g. Nugent's) being close to it. They may also lead to distinctively different cost for the app development team: those who prefer intricate programming may normally be expected to spend more in the making than those who do not.

There is a third point emerged from Gaudriot's answer that is worth exploring. Gaudriot mentioned a case of a quality narrative app being made at very low cost. This seems to suggest that a way to reduce the cost for making the narrative app is to reduce the cost on hiring programmers. However, to keep the technical intricacy at the same time, the artists might need to have sufficient programming skills, which may raise the bar for artists who want to make narrative apps but are with low budget and little coding experience. Nugent expressed a similar concern in one of our skype conversations. She revealed that the programmers for her app were paid the most. To reduce the technical cost as much as possible, she decided to learn some basic

[96] '[…] je crois à une nouvelle lecture, je pense que tout est à inventer'

coding.

Technical barriers and financial difficulties appear to be two common challenges for the app development teams. However, there are also other challenging factors that may be case or cultural specific. For example, Nugent revealed her unpleasant experience with Canadian Children's Book Centre while trying to introduce her app to them. She wrote:

> There are no recognitions or awards for picturebook apps in Canada as there are in many countries in Europe, and story apps are not included in The Canadian Children's Book Centre's (CCBC) annual publication *Best Books for Kids and Teens*. When I approached the CCBC about it, they refused to even discuss it. There is little intelligent criticism of story apps and many have stopped making them and their apps are no longer in the app store. The few remaining reviewers of story apps take an instrumental approach ("educational") and only value apps which overtly prioritise word recognition. It would be very nice to have some informed reviewers of the app as literary artwork. (Nugent, Personal email, 15 May 2017)

There are two points that may be perceived from Nugent's words. Firstly, she seems to suggest that the narrative app was less recognised as literature in Canada than in many countries in Europe. Secondly, she seems to suggest that the narrative app was reviewed more as an educational tool rather than literature. This problem identified by Nugent may be alarming to the narrative app researchers considering that academically, the app is usually examined from an educational perspective, but few studies are from literary perspective. If academic research tendency can be a factor that may influence the development of the narrative app, the lack of the voice of literary criticism might potentially contribute to reducing the proportion of literary aspects in a narrative app product. If we are to recognise the narrative app as children's literature, we may need more studies on its literary aspects. From another perspective, the lack of literary studies on the app may suggest that academically, there might still be an uncertainty about how to position the narrative app. In this case, to develop a better understanding of its nature, it may be helpful to have a thorough examination on the various aspects of the narrative app rather than a single focus on its educational potential.

The Future of the Narrative App

The Potentials

Based on the computer technology, the narrative app has an exceptional advantage to host exciting and innovative ideas of storytellers who may not be able to express them elsewhere. For example, in the official homepage of *Spot* (2015/2015) app, David Wiesner reveals that when he picked up the iPad for the first time, and pinched his fingers together to make things big, he realised that 'it would be a great way to explore an idea [he has…] been playing around with since art school' (http://bitu.com/spot/behind-the-scenes-2 accessed on 22 July 2017).

As introduced in Chapter Three, *Spot* (2015/2015) plays with an idea of zoom lens. Taking advantage of the zoom function provided by the touchscreen technology, Wiesner provides five intertwined worlds for the interpreter to explore and to travel across by simply pinching her/his fingers at a portal image. There are five portal images and they are omnipresent in all of the five worlds. Once in a world, by continually zooming in on an image, the interpreter will be presented with more and more details of various narrative content, and some of the narrative content also contain many details that can only be seen by zooming-in.

Early in 1995, the artist Istvan Banyai had already explored this idea of zoom lens effect in two wordless picturebooks *Zoom* (1995) and *Re-Zoom* (1995a) where the artist plays with the concepts of long shot and close-up shot in films. In *Zoom*, Banyai starts the story by offering a small part of the picture in the first double spread, and then keeps moving on towards presenting a larger part of the picture in the following pages until he shows the complete picture in the last double spread (see figure 5-7). Until then can the reader finally realise what s/he has been presented with. *Re-Zoom* is the opposite where the artist presents the complete picture in the beginning and moves on to presenting the details.

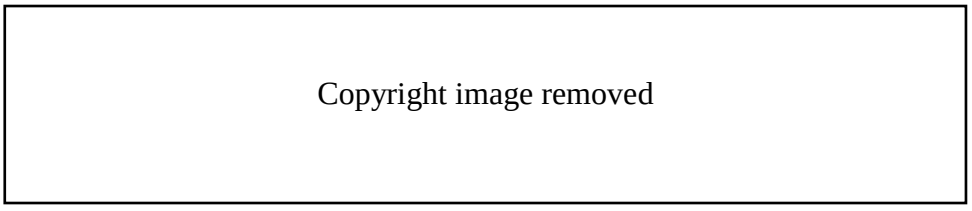


Figure 5-7: First four rectos from the picturebook *Zoom* (Banyai, 1995).

Although the ideas of the books *Zoom* and *Re-Zoom* and *Spot* (2015/2015) are essentially similar, the affordances of the two media, paper and the touchscreen, do not seem to be the same in terms of the traversal experience they can offer to the interpreter, and the degree to which they can play with the idea of zoom lens. For example, the picturebooks cannot afford to be zoomed in or out endlessly, and it cannot afford moving images on the page. In addition, the app seems to be able to offer a stronger sense of control and freedom to the interpreter in choosing her/his traversal path because the app is built on a physically nonlinear narrative structure that is 'invisible' to the interpreter. However, it is not easy to use the picturebook format to build a nonlinear narrative structure that is invisible to the interpreter because for the picturebook, all the narrative content is presented in a linear fashion and visibly. As the pictures in the picturebooks are fixed and still, the narrative development in the picturebooks are fixed. Thus, the interpreter may not feel much in control of the narrative as s/he may feel with the app.

This comparison is by no means to devalue the picturebook. It is meant to demonstrate that the narrative app can offer various possibilities for storytelling. These possibilities, once realised, may offer exciting traversal experiences to children who usually have curious minds to explore the world. For example, there are many narrative apps that engage children in a variety of physical ways, allowing them to use their fingers, hands and the whole body to follow and construct the narrative, and to take 'control' of the narrative development. A typical example of such apps is *Wuwu & Co.* (2014/2017) that contains 360-degree fully illustrated background. To get access to all the characters and their stories, children need to hold their tablet computers and move physically through 360-degrees, and sometimes move the tablet up and down to search for narrative content. The interpreter can also decide which character in the scene s/he wants to explore and how. In fact, nowadays, it seems that offering the interpreter a sense of freedom and control in traversing the narrative world has become a popular concept. Quite recently, on 20th June 2017, Netflix launched its first 'interactive show', *Puss in Book: Trapped in an Epic Tale* on Kids channel for North American countries. This episode is built on a branching narrative that allows children to (partially) take in charge of the story. From Netflix's case, it seems that there are exciting opportunities for the narrative app development teams to explore and to inspire.

Apart from the exciting possibilities that the narrative app may bring to storytelling, some primary research (e.g. Hourcade et al., 2013; Murdock et al., 2013) found educational potential

in the narrative app. Their findings suggest that the touchscreen technology can be used to help children diagnosed with Autism Spectrum Disorders establish social interaction. Warren Buckleitner (2015), an educational psychologist and the founder of Children's Technology Review, and the KAPi and BolognaRazzi Digital awards, particularly points out that touch is natural and important in the early stage of children's development. He suggests that apps based on touchscreen technology are ideal tools to enable children to learn, especially in their early years when they have not developed necessary skills to use a mouse. This does not mean that every child should therefore be given a touchscreen device to play. Instead, Buckleitner views touchscreen devices as options that should be available to children. He expressed this opinion in an interview during the From Paper to Screen: The Future of Digital Children's Publishing Conference held in Montreuil, France in 2015:

> If you watch children, you'll quickly understand that to them there isn't an 'if', 'or'. I mean, they use books and they use screens. It's just another option. […] It's important every child has many options. (Transbook, Children's Literature on the Move, 2015)

In the same interview, Buckleitner also justified app storytelling. He said,

> I think adults traditionally see things from the past view forward, and that's the wrong way to look at it. If you boil it down to good stories, reading, illustration, these kinds of quality, it doesn't matter if it's on a screen or if it's on paper. (ibid.)

Buckleitner's argument is supported by the previous theoretical findings in this thesis. It has been demonstrated in the previous chapters that from the perspectives of the MTB and of the literary value, the narrative app does not have intrinsic differences from other kinds of literature. As for the actual traversal experience of the interpreter, for what the narrative app can offer to children's development, and for whether screen-time is harmful to children, there is not yet sufficient research evidence to indicate one way or another. This means there are much more to explore about the potential of the narrative app.

The Future Book and Reading

As digital technology develops in an astonishing speed, it is difficult to predict the precise future of the narrative app. The attitude of the current market towards the digital publishing appears to be ambiguous and controversial based on the debates among various publishers presented in online issues of *The Bookseller* (http://www.thebookseller.com/ accessed on 9

September 2017), an authoritative business magazine of the book industry since 1858. In the recent issue of *The Bookseller*, Nuttall (2017) suggested that many publishers seemed to be reluctant to take the risk of investing in digital publishing due to its cost, but according to her, literature in a digital format will be part of the future despite everything. She writes:

> You'd have thought that this was the perfect time for new digital book forms to finally ent[re] the spotlight. Yet with sales of physical books rallying, many publishers seem to have given up experimenting in this realm. Spooked by costly innovations that have not paid off in the past, they're clinging onto the idea that their core competency – print – will continue to save them.
>
> […] It is only when we renounce the structures, aesthetics and ideologies of print, and look at cultures and traditions beyond the literary, that we will find what's truly 'next' for books. Future books will be born from digital thinking, drenched in a passion for creative culture in all its forms, and play seamlessly with a variety of technologies. This means that now more than ever, publishers need to stop relegating 'digital' to departments and become true digital polymaths.
>
> […] Physical books have wonderful and irreplaceable qualities. But digital is only going to conquer ever more of our lives, imaginations and entertainment time. To be part of the next wave of electronic literature, publishers must become far more ambitious in their thinking – and far more integrated in their execution. (n.p.)

Nuttall seems to suggest that literature being in digital formats is an irresistible future, but what temporarily 'prevents' the flourish of digital publishing seems to be an undecided attitude towards digital literature. This suggests that the codex is still recognised as a standard format of literature and reading. This way of thinking can be detected from CCBC's attitude towards Nugent's narrative app, where mostly print books or digital books resembling the codex format were considered as literary forms. Moreover, according to Gaudriot's email response (Personal email, 1 March 2016), French Ministry of National Education offered subsidies to support digital reading only if it was in the format of the e-book running on epubs (i.e. e-books presented in traditional print book formats). This seems to suggest that multimedia and multimodal ways of experiencing literary works like narrative apps was not recognised as a way of reading by French Ministry of National Education in 2016.

However, as suggested by Nuttall, the world is changing dramatically with the development of various technologies, and the form of literature and reading is changing as well. No matter how reluctant, the publishers might have to accept the fact that electronic/digital literature has been existing since the beginning of computer technology and has dominated a firm ground in

literature (Hayles, 2016). The emergence of digital children's literature in 2010 suggests that this ground seems to be expanding rather than shrinking. Academically, being a vital part of the electronic/digital literature community, the Electronic Literature Organisation (ELO), established in 1999, has been actively exploring digital literature and enabling artists and authors to express their literary ideas in various digital formats (http://eliterature.org/ accessed on 9 September 2017). So far, the annual ELO conferences have attracted academic researchers from all over the world. Both University of California, Los Angeles and MIT have been its headquarters. Academic interests and artists' experiments in various digital formats of literature seem to suggest that traditional understanding of literature and reading is being redefined.

Having said that, Gaudriot and Nugent both suggest that one of the first few steps for publishers to embrace digital age seems to be a collaboration between the traditional publishing and the digital publishing:

> **Gaudriot:** I think today that the two are indissociable. The traditional publishing needs the digital publishing, and vice versa. […] They are complementary, not competing […]. It is a great challenge for digital publishing but it will not be able to do it without the traditional publishing[97]. (Personal email, 1 March 2016)
> **Nugent:** It [i.e. A bright future of the narrative app] depends on bridging the divide between picturebook publishers and developers – each desperately needs to learn from and respect the other. (Personal email, 15 May 2017)

It is indeed important to build mutual understanding between the traditional and the digital publishing. However, to suggest that the two types of publishing learn from each other does not mean that they should copy each other. Acknowledging the tie between the digital publishing and the traditional publishing, Gaudriot points out that the future narrative app should not be a (picture)book going digital. She explained her idea of one responsibility of the future publishing in the email:

> **Gaudriot:** Work on creating stories for all media (books, computers, tablets, phones) by exploiting each medium for what it is. Do not make a copy of the book to paste it on a tablet but bring in something more. Between game and book, offer adventure and dream![98] (Personal email, 1 March 2016)

[97] 'Je pense aujourd'hui que les 2 sont indissociables. l'édition papier a besoin de l'édition numérique et vis et versa. Elles sont complémentaires, et non concurrentes, et le défi est là. Oui c'est un grand défi pour l'édition numérique mais elle ne pourra pas se passer de l'édition papier.'

[98] 'Travailler sur des histoires pour tous les supports (livres, ordinateurs, tablettes, téléphones) en exploitant chaque support pour ce qu'il est. Ne pas faire une copie du livre pour le coller sur une tablette mais y amener quelque chose en plus. Entre le jeu et le livre, offrir de l'aventure et du rêve !'

Gaudriot's answer together with Nuttall's insight of the future books reinforce an important point that has been constantly indicated in this thesis, that is, medium is a crucial component of storytelling, an integral part of the narrative. Therefore, it is important for the future digital publishing to explore the affordances of a digital medium, and to study what the chosen medium does the best among all other media in contributing to the construction of the narrative. As Nuttall (2017) suggests, 'Truly digital books require truly digital thinking' (n.p.).

Conclusions and Implications

This chapter complemented the previous theoretical study of the narrative app by examining the app as a commercial product. I argued that the narrative app is an integration of storytelling and programming, and therefore, the software aspect of the app cannot be overlooked in developing an understanding of the narrative app.

Two important questions to emerge from the discussion are how to perceive the technical aspect of the app in relation to its narrative content, and how this relation may affect my theoretical understanding of how narrative apps work.

About the first question, among the studied publishers, there seem to be two different views. Most of them appear to regard the technical aspect as part of the narrative, while Nugent alone seems to treat it (perhaps unconsciously) as a tool to deliver the narrative. However, this study suggested that the two views do not seem to affect the creation of the narrative app in terms of its performance and narrativity. In addition, both views agree that everything including the ludic features designed in a narrative app must support the storytelling rather than disturbing it, which suggests a crucial difference between a narrative app and a game app. In the former, games are secondary to the narrative, while in the latter, the narrative is used to serve the play.

Having said that, by examining the making procedure of the narrative app and its potential barriers, this study found that despite the divergent opinions among publishers, the software aspect of the narrative app seems to be an inseparable part of its narrative. This is because the programming decides the functionality of the narrative app, and the functionality decides the delivery of the narrative content. In addition, the narrative and art design of the narrative app also seem to rely highly on the technical affordances of the tablet computer. Therefore, the programming appears to be an integral and crucial part of the app's narrativity. In other words,

the narrative in a narrative app is not only about the abstract concepts such as the story and the discourse, or the catalysis and nucleus, but also about everything else that enable a complete and smooth performance of the app.

This suggests that (to answer the second question), the study of the mechanical layer and the interpretative layer of a narrative app cannot avoid looking into the technical aspect of the app. As discussed in Chapters Three and Four, the narrative content, the medium and the interpreter influence each other in generating and arranging signs in the app. How an interpreter may experience the app depends on how s/he is required to be physically involved in constructing the narrative. How s/he may interpret the physical requirement depends largely on what s/he perceives from the app, while what s/he perceives depends on, to a large degree, what is presented in the medium. Thus, when the technical issue affects the design or the performance of a narrative app, what it affects is, intrinsically, how signs can be generated and presented in the medium through a collaboration of the interpreter, the medium and the narrative content. Thus, it may be necessary to take the technical aspect of the app into consideration when conducting a critical evaluation/analysis of the narrative app.

In terms of evaluation and analysis, this study suggested that, so far, the narrative app had been evaluated or analysed more from an educational perspective than a literary perspective, which appeared to be a shared phenomenon in academic studies and among app reviewers. This study has suggested that a single-direction of the app research could be dangerous while a thorough exploration of all aspects of the narrative app is needed. This chapter set an example of a literary analysis of the narrative app with A & A's *Pierrot Pierrette* (2015/2015). What may be perceived from this proposed method is that a narrative app is a type of multimedia storytelling, and therefore it is necessary to consider the behaviours of all media in order to analyse its narrative content.

In terms of the future of the narrative app, this study suggested that the narrative app appears to have exceptional advantages to innovate storytelling. Its literary and educational aspects may be two major areas to be further explored in the future. However, this study pointed out that as the narrative app is a commercial product, the market is vital to its survival. Despite the current ambiguous attitude of the publishers towards the digital publishing, it was suggested by some voices in the book publishing industry that digital formats would probably be important media

for the future books. Two publishers also predicted that the traditional and digital publishing may co-exist in the near future, and both may need each other to survive.

Finally, there is an important point raised by the publishers that seems to accord with my theoretical understanding of medium in storytelling. Medium appears to be an inseparable constituent of the narrative, no matter in digital or non-digital storytelling. Therefore, to deliver quality narrative and to innovate storytelling, it is necessary to explore and to exploit the unique affordances of the chosen medium for the literary work.

Conclusions and Implications

This study was conducted to explore three interrelated questions:

1. What is a narrative app?
2. How does it tell stories?
3. How to evaluate it in the context of storytelling?

The First Question

Based on this study, a narrative app may be described in short as *a piece of application software developed to tell stories (usually to children) in a participatory way on a touchscreen computational device for various purposes*. This description is, however, not meant to be definite, but it suggests two intrinsic features of a narrative app, that is, the software features, and the narrative features, both of which may require equal attention.

As software, a narrative app can be considered as a set of computer codes that abide by computational rules. This may suggest that firstly, a narrative app does not have any physical form, and secondly, it requires software updates to be functional in the target operating system of a computer. The latter part of the statement indicates that as long as the narrative app is still on the market, it is constantly in development.

In terms of the textual presentation, this study has identified three distinctive stages so far in the short history of the narrative app development, namely the *First-Generation* app, the *Second-Generation* app, and the *Third-Generation* app.

The First-Generation app does not seem to show distinguishing ways of presenting a story from a picturebook. Although it has some very basic participatory features such as tap to change scenes, or tap to make a sound, this generation of the narrative app looks very much like a picturebook but without its materiality. Thus, in the very beginning of the narrative app development, a narrative app was usually addressed by children's literature scholars as a digital picturebook or a picturebook app. The Second-Generation app seems to reflect more digital thinking of the designers. It appears to adopt narrative strategies from a variety of literary media

such as those used by animated films, electronic literature and picturebooks. However, this generation of the narrative app still appears to maintain a crucial feature of codex literature, that is, the necessity of page-turning. The page-turning effect and its equivalents have disappeared in the Third-Generation app where stories are presented in ways that may be unique to digital storytelling.

The comparison between the narrative app and the codex is by no means to prioritise either. However, the development of the narrative app design seems to have shown that the storytellers have been seeking innovative forms of literature, and by doing so, they have been exploring and exploiting the affordances of digital media.

The Second Question

For the question of how a narrative app tells stories, this study has examined three aspects of the narrative app:

- The nature of its storytelling methods
- Its MTBs
- The relationship between its textual mechanics and its narrative structure

The Nature of the App Storytelling

This study has suggested that among the narrative app it accessed, none of them have appeared to tell stories in an interactive way, but they seem to tell stories usually in a participatory way. This finding seems to contradict a popular belief that the narrative app contains highly interactive features.

This study has posited that interactive features may not be considered the same as participatory features. The former may require a series of conditions (including participation) which are not easily met. In fact, it seems that, currently, to build interactive elements in a digital product, it usually involves AI technology which is rarely applied in the current narrative app design. As for participatory features, this study seems to have found that all the participatory elements in the narrative apps accessed by this study, in fact, display uniformly one distinctive feature, namely, *commanding-executing feature*. As the name suggests, this feature usually

requires a cooperation between a commander(s) and an executor(s). It is usually through this cooperation that the story in a narrative app gets unfolded.

Although the nature of all the participatory elements seem to be the same, this commanding-executing feature may appear in various specific forms in different narrative apps. So far, this study has identified three groups of applications of commanding-executing feature in the narrative app.

Specifically, in terms of participatory roles, the commanding-executing feature may be applied in a narrative app in the following patterns:

[1] Human commander – app executor type (roles nonexchangeable);
[2] App commander – human executor type (roles nonexchangeable);
[3] Human commander/executor – app executor/commander (roles exchangeable)

In terms of participatory actions, the commanding-executing feature may appear in the following patterns:

[1] Single round of command and execution in a mutual discourse;
[2] Multiple interrelated rounds of commands and executions in a mutual discourse.

In terms of participatory immediacy, the commanding-executing feature may be presented in the following patterns:

[1] Immediate command(s) and execution(s), where the command(s) and the execution(s) do not need to go through a third party, a messenger;
[2] Delayed command(s) and execution(s), where the command(s) and the execution(s) need to go through a third party, a messenger.

The Mechanical Textual Behaviours (MTBs)

This study has suggested that a narrative text can be regarded as a mechanism, a concrete machine that consists of the narrative content, the medium and the interpreter. It appears that what presented in the medium to the interpreter is a result of a collaboration between the three

elements. The actual arrangement of signs was addressed by this study as the MTB. Some narrative texts may require more physical involvement by the interpreter in constructing the narrative, and some may not. Based on the MTB, this study has developed a storytelling mechanism theory which includes a series of detailed logical inquiries to help classify texts into different categories. This classification has been generated into a storytelling mechanism theoretical route map which can help locate the positions of most narrative texts in the space of textuality.

Based on this map, this study has examined the textual behaviours of the narrative app in relation to other forms of literature. It appears that mechanically (i.e. how signs are generated and arranged in the medium), the textual behaviours found in the narrative app are evident in various literary media, which seems to suggest that, at a mechanical level, the narrative app does not seem to show any essential differences from other forms of literature, although in the sense of the traversal experience, the narrative app may provide something different. However, the theme of the traversal experience is not of the concern of this study at this moment. It should be pointed out nevertheless that the discussion of the storytelling mechanism theory indicates that any different answer given to the 35 questions will result in a complete different traversal route on the *Storytelling Mechanism Theoretical Route Map* – in other words, a different traversal route suggests a different traversal experience both physically and presumably cognitively, which might be worth exploring in future studies.

The Textual Mechanics & the Narrative Structure

With the findings about the MTBs of the narrative app at hand, this study has explored the relationship between the textual mechanics of the narrative app and its narrative structure. The narrative structure has been explored from two aspects: the semantic structure of the narrative content and the physical structure of the narrative text.

Based on the storytelling mechanism theoretical route map, this study has found that the variation of the narrative structure of a narrative app appears to be closely related to the number of the interpreter's selective movements[99]. Specifically:

[99] The complete discussion is in the section of 'Further Exposition of the Typology' in Chapter four (p.154-173).

- In terms of the physical narrative structure, narrative apps that allow no selective movement on the part of the interpreter usually (but not necessarily) have linear structure, while those that allow selective movements usually have nonlinear structure which appear to be either branching or foldback.

- In terms of the semantic narrative structure, theoretically speaking, both types of narrative apps seem to be capable of presenting unstable nuclei and catalyses, but narrative apps that allow selective movements on the part of the interpreter seem to provide the interpreter with stronger sense of control over the narrative outcome.

After dividing narrative apps into those that allow selective movement and those that do not, this study seems to have identified some connection between the app's mechanics and its narrative structure. This connection can be summarised as follows:

- In terms of the connection between the interpreter and the narrative content, [1] if the app's mechanics do not invite any selective movement on the part of the interpreter, the interpreter does not seem to have any influence on the construction of the narrative structure. In other words, s/he does not seem to be able to affect the presentation of the fabula or the discourse, or the nuclei or the catalyses of the app storytelling. [2] If the app allows selective movement on the part of the interpreter, s/he may influence the construction of the narrative to various degrees. If her/his selective movement involves generating nucleus-content, s/he may (but not necessarily) influence the fabula of the storytelling; if the selective movement only involves generating catalysis-content, s/he does not seem to have crucial influence on the storytelling although s/he may change the discourse of it.

- In terms of the connection between the medium and the narrative content, [1] if the app's mechanics do not allow any selective movement on the part of the interpreter, it seems that the medium may play a crucial role in the presentation of the narrative. Dependent on the affordances of the medium and how well the designer can take advantage of such affordances, the medium may be able to present a linear narrative structure as well as nonlinear narrative structure for the app storytelling. [2] If the app's mechanics allow selective movements on the part of the interpreter, the medium, the interpreter and the

presented narrative content all actively take part in the narrative production. In this situation, the nature of the medium, above all, must afford such narrative design, i.e. it is possible to use such a medium to display the kind of narrative content that allows selective movements on the part of the interpreter. Afterwards, the interpreter can materialise this structure in the medium by selecting preferred nuclei and catalyses. During the interpreter's traverse, the presented narrative content seems to 'guide' and/or 'inspire' the interpreter's selective movements.

- In terms of the connection between the interpreter and the medium, it is the affordances of the medium that seem to determine the possibility and the degree of the interpreter's selective movements provided that the designer has fully explored the medium's affordances.

The Third Question

For the question of how to evaluate the narrative app in the context of storytelling, this study has proposed that this evaluation may need to consider both software and narrative aspects of the narrative app, and most importantly, a thorough evaluation may need to consider the narrative app as both a literary form and a commercial product because the creation of the narrative app appears to have critical effect on its narrativity.

To be specific, theoretically speaking, to evaluate the narrativity of a narrative app, we may need to consider the quality of both its fabula and discourse. Thus, this study has proposed two theoretical exploratory criteria[100] for the evaluation of the narrative quality of a narrative app:

1. The app's narrative structure (whether it be branching narrative or foldback narrative) should at least contain interrelated nuclei and catalyses, that is, the nucleus-NSs and the catalysis-NSs are related to each other while the catalyses in each nucleus-NS should be related to their dominating nucleus or nuclei.

[100] For a full discussion of this criteria, please refer to the section of 'Narrative Structure & Narrative Quality' in Chapter Four (p. 174-178).

2. The mechanics of the app should be designed as such so that during the interpreter's traverse, her/his selective movements can contribute to the storytelling in terms of its narrativity. In other words, when the interpreter decides to activate a hotspot, this action together with the additional narrative content triggered by her/him should arguably enrich her/his experience of the narrative.

However, from a practical perspective, the narrative in a narrative app is not only about these abstract concepts, it is also about everything else that enables a complete and smooth performance of the app. Particularly, this study has suggested that the programming of the narrative app decides its functionality while its functionality in turn decides the delivery of the narrative content. What is more, the narrative and art design of the narrative app also seem to rely highly on the technical affordances of the touchscreen device. Therefore, the software aspect of the narrative app appears to be an integral and crucial component of the app's narrativity.

In the very beginning of Chapter Four, I quoted a line from Luesebrink (2001) who writes for *Electronic Book Review*. It says, '[It] is not the computational function of the link that constitutes the literary value – the link is just a device' (n.p.). This quote does not contradict the statement just made previously. What this study means to suggest is that the medium and its potential function alone do not seem to have any connection with literary value, but when they are used to present literary content, *how* to explore and exploit them to serve literary purposes is something that closely affects the literary value of a literary work.

Despite the fact that the narrative apps accessed by this study does not seem to display anything essentially different from what we have already seen in storytelling elsewhere, this study has also suggested that the narrative app has great potential to deliver some truly innovative ways of storytelling with the advance of technologies. For example, although the narrative apps accessed by this study do not seem to show any interactive features, the app as software has potential to be developed as an interactive storytelling tool. This is, however, not to suggest that being interactive should be a pursuit of the future app designer. It has been pointed out in this study that interactivity and narrativity in digital storytelling do not seem to imply the existence of each other, and therefore may not be used as a criterion to evaluate the narrative app.

Moreover, based on the findings of this study, it may be concluded that although the narrative app displays some artistic and narrative features seen in the picturebook, it is in many ways different from codex (children's) literature. Therefore, it might be fruitful to develop new methodologies to study this type of digital (children's) literature. For example, this study has offered a brief example of how to analyse a narrative app from a literary perspective. The analysis seems to have shown that a traditional literary critical analysis may only need to deal with static visual and verbal signs, but the analysis of the narrative app needs to consider visual, verbal and auditory signs as well as the participatory features in the construction of the app narrative. This complexity in the narrative pattern found in the narrative app seems to be something that was not seen in codex literature.

In fact, as suggested by some publishers, the majority of publishers seem to prefer codex publishing to digital publishing due to the expensive cost of the latter, but based on the status and the development of digital technology, it seems that digital (children's) literature is something that has the potential to thrive. Therefore, academically, we may need to be prepared for it. This is, however, by no means to suggest that digital literature and codex literature are competitors. Rather, it is believed in this study that the two types of literature complement each other, and based on the insights of some publishers, the two kinds of publishing are very likely to co-exist and depend on each other in the future.

Furthermore, in the aspect of education, it is suggested that the narrative app seems to have educational potential, but we may need more research to explore how to make best use of the narrative app in classroom and at home. In other words, it may be too soon to define the narrative app in the aspect of its impact on the development of a child. More searching studies are urgently needed.

The Contributions to Scholarship

This study has moved towards filling two theoretical holes in the studies of children's literature. The first one is the lack of a clear definition of interactivity which appears to be a key word in digital literature discourse. The second hole is the lack of a theoretical method to examine digital literature such as the narrative app.

Firstly, by referring to literature from different disciplines, this study has developed a theoretical understanding of the concept of interactivity in the context of computer-mediated communication. The definition provided by this study can distinguish interactivity from other closely related terms that are often used interchangeably with it. Most importantly, this definition can successfully distinguish between interactive art form/literature and non-interactive art form/literature in the context of computer-mediated communication, which may make the term interactivity no longer vague or ambiguous.

Secondly, to study the narrative app, this study has developed an original storytelling mechanism theory that can be used as a theoretical framework to study digital (children's) literature. In fact, this theory may be applicable to the studies of both digital and non-digital (children's) literature. In other words, the emergence of this theory seems to have met the most important aim of this study, that is, this study seems to have obtained a scope that is media-specific (under which we may examine a particular literary medium behaviour and/or textual behaviour), but at the same time, it can also be media-inclusive and hold no prejudices against any medium. In addition, this theory can also be used to study the different traversal experiences of the interpreter. Based on the theoretical route map, different physical involvement on the part of the interpreter will occupy a different dot on the map. In other words, how the interpreter may experience a piece of literature is largely dependent on how he is involved in constructing the narrative physically. This suggests that the storytelling mechanism theory does not separate meaning-making from narrative construction, but rather, it has great implication on the connection between the textual meaning and the textual presentation – how the interpreter interprets a narrative text relies on what he is presented and how he is physically involved in the narrative construction. In other words, although the mechanical layer and the interpretative layer of the storytelling mechanism is discussed separately, they are interrelated and affect each other. Having said that, the storytelling mechanism theory is meant to be a broad framework to study textual and media behaviours, but it is certainly not intended to be the only way or the best way to explore a text or a medium.

Overall, it is suggested that this study may provide an effective scope and methodology for the study of the field of digital children's literature, which may offer the potential to strengthen this relatively recently established field of study.

Some Questions for Future Research

This study of the narrative app has led to many questions that may be worth exploring in the future research. For example:

- How to explore the educational potential of the storytelling mechanism theoretical route map, particularly in the aspect of teaching new literacies?

- What distinctive experiences an interpreter may have when s/he traverses texts based on different textual positions on the route map? What can the findings tell us?

- How do children respond to the bugs in a narrative app? Will the bug affect anything in children's understanding of the story, and in their appreciation of the narrative and aesthetic quality of the app?

- What can interactive literature offer to children? How should we evaluate interactive literature in relation to a child's reading development?

- Is there any difference in the cognitive processes of children when they are exposed to computer-mediated communication environment compared to non-computer-mediated communication environment?

Although there are many questions about the narrative app that remain to be explored, this study tends to believe that the narrative app, like a book or a toy, is just an object that has no real intention of itself. What matters is what it contains as well as how it is used, but the answers to these aspects of this new phenomenon are as yet unknown.

This study may well be considered a 'base-line' study, and as such it sets potential parameters for other studies to follow. It has become clear though, that the work undertaken in this research has only begun to scratch the surface of a potentially huge and rich research seam within children's and digital literature contexts: the prospect is exciting and the effects likely to be far-reaching.

Glossary

App

An abbreviation for application, also known as application software, is a self-contained piece of computer programme allowing the end-user to engage with a computer, can be designed for any computational device, such as mobile devices or desk top devices. In recent years, the term has been used more narrowly when referring to applications downloaded by the end-user to run on a mobile device, such as a smart phone or a tablet computer. Neither the broader sense nor the narrow sense of an app indicate any level of interaction, if exists, between the end-user and the computer.

A feedback loop

Contains at least two rounds of feedback where the message initiator has the opportunity to give response back to the message receiver based on the feedback sent by the latter in the first round of the message exchange as a basis of modifying the communication to bring it closer to certain mutually desired result(s) by either the participants or by an outsider or outsiders who direct(s) the actions of the participants.

A moment of a complete traverse/A momental piece of a complete traverse

A complete traverse is considered as being constituted by various moments. The length of each moment is adjustable based on the purpose of the inquiry.

Branching narrative

Viewed from it physical structure, a narrative that offers options for the interpreter to choose from to proceed with the narrative. It allows the interpreter to experience the narrative differently each time s/he traverses the text. The narrative offers more than one plot line that split off from each other at different points.

Catalyses

A term in narratology referring to subsidiary notations that cluster around nuclei but do not modify the nature of the nuclei. They are no more than consecutive units, purely chronological, associated with discourse (how the fabula is told).

Complete traverse

The situation where the interpreter completes all necessary physical tasks (e.g. turning a page, tapping on a hotspot on the touchscreen) and travels through all the necessary parts of the text so that s/he is considered to have had a complete experience of (one version of) the narrative.

Décor

The cinematic and/or participatory/interactive elements in a narrative app.

Digital immigrant

A narrative app that largely bears the resemblance of the presentation of stories told on non-digital platforms without much exploitation of the potential or the affordances of the digital media for digital storytelling in spite of its stories being original or not.

Digital native

A narrative app that is tailored for digital storytelling, exploiting the potential and the affordances of the digital media in spite of its stories being original or not.

Dramatic action

An action on the part of the interpreter that changes the direction of the plot line and, in turn, future events in narrative as the interpreter will experience it.

Emergent narrative

A narrative that entirely emerges from the communication between the interpreter and the systems that govern the narrative traverse.

Feedback

The response from the message receiver to the message sender on the basis of modifying the communication to bring it closer to certain mutually desired result(s) either by the participants or by an outsider or outsiders who direct(s) the actions of the participants.

Foldback narrative

A narrative similar to a branching narrative except that it contains inevitable events which all traversal options must lead to. In addition, it only has one ending.

Home scene (HS)

A scene usually comes after the LS, generally displaying one or more of the following content: the title of the app, names of authors, option buttons for different ways of traversal experience (such as read by oneself or be read to, sound effect on or off, etc.), hints for full exploration of the app, and hyperlinks to credits, developer's information, developer's other apps, and information for adults, etc. Some may also present a very limited amount of narrative content.

Home scene button

A function button in a narrative app that is usually, but not necessarily, designed as an image of a house where one can tap to go to the HS.

Hotspot

A small area with specific coordinates (for the developers) on the touchscreen, coded with hidden crucial or additional narrative content such as audio, visual and verbal elements.

Linear narrative

In the narrative app, if the future events and the direction of the narrative cannot be changed by the interpreter, this narrative app is considered to have a linear narrative.

Instant moment

A single moment of the traverse, or a momental piece of the traversal experience where certain number of textons are presented to the interpreter as scriptons in the medium.

Interact

A verb that implies or addresses the ability or potential of the participants to construct interaction.

Interaction

A two-way communication involving two or more participants with intentionality or simulated intentionality that actively exchange reciprocal messages in real time via a communication channel on the purpose of achieving certain desired result(s) out of the communication, and such a communication between or among the participants are modified physically in regard to the form or semantically in regard to the content for at least two rounds.

Interactive

An adjective that addresses the attribute of the communication environment or the communication channel, and it indicates that the environment or the channel has the potential to host interaction.

Interactivity

The extent to which at least two participants with intentionality or simulated intentionality can actively exchange reciprocal messages in real time via a communication channel with the purpose of achieving certain desired result(s) out of the communication, and such communication between or among the participants are modified physically in regard to the form or semantically in regard to the content for at least two rounds.

Interpreter

The person who receives, interprets and/or reacts to the narrative content.

Logo scene (LS)

A scene that shows app developer's logo usually with animated features.

Mechanical textual behaviour (MTB)

An arrangement of signs, where at a mechanical level, the characteristics of the medium determine the extent to which the signs in it can move or be moved around and rearrange themselves or be rearranged.

Medium

The physical agency via which the narrative content is directly presented.

Multiple fabulae app

A narrative app that has more than one fabula in the narrative where *what happens* can be determined to some extent.

Narrative content

The story intended to be told, i.e. the abstract concepts to be materialised into signs that include, but are not limited to, visual, verbal, auditory and tactile signs.

Narrative scenes (NSs)

Scenes that present the main narrative/narratives (*what happens* and how *what happens* is told).

Narrative structure/Structure of a narrative

It contains two layers: the *semantic structure of the narrative content*, i.e. how each basic narrative unit is connected to each other semantically, and the *physical structure of a narrative text*, i.e. how a text can be traversed by the interpreter physically, or in other words, the traversal routes in a text that are made possible by the design of the mechanics of the text.

Navigation button

A function button in a narrative app that is usually, but not necessarily, designed as an arrow or a hand pointing to the direction of the narrative flow. One can tap it to go to the previous or the next scene.

Nonlinear narrative

In the narrative app, if the narrative allows the interpreter to influence its development such as plots and/or endings, this narrative app is considered to have nonlinear narrative.

Nuclei

A term in narratology, referring to consecutive and consequential events, chronologically and logically linked, directly affecting the continuation of the story. They are related to fabula (what happened).

Option button

A function button in a narrative app through which one can choose from different options provided to experience the narrative app in different ways.

Position of signs

The temporal arrangement (the sequence of appearance in the medium) and the spatial arrangement (the position to each other in the medium) of signs.

Same arrangement of scriptons

The situation where both the content and the position of the scriptons and their adjacent scriptons are the same.

Scene

A visual and auditory entity that presents a complete unit of the story on the touchscreen device. The unit usually depicts a single action taking place in a single location.

Scene tag

A function tag in a narrative app where one can drag to reveal the story pane.

Sequence of scriptons

The order of the appearance of each scripton.

Scriptons

Strings of signs as they appear to readers. In other words, they are the information or signs displayed, arranged or rearranged in the medium for the interpreter, but do not necessarily have to be seen, sensed or understood by the interpreter, nor is it necessarily a result of the interpreter's actions.

Single fabula app

A narrative app that only has one fabula in the narrative where *what happens* cannot be determined.

Stability of signs

The stability of the content and the position of signs.

Stable mechanical textual behaviour (Stable MTB)

The arrangement of signs (e.g. visual, verbal or tactile, dynamic or still) does not change physically compared with that in any other time when being traversed by any interpreter.

Stable medium

Something or someone that is consistent considering its/her/his/their performance(s).

Story pane

A design similar to chapter selections in DVDs, that consists of screenshots of all scenes in the app. One may choose any scene to continue with the story.

Structurally nonlinear text

An object of verbal communication that is not simply one fixed sequence of letters, words, and sentences but one in which the words or sequence of words may differ from reading to reading because of the shape, conventions, or mechanisms of the text.

Text

A mechanical device including signs, chosen medium/media, and interpreter(s), where signs can be all kinds of signs (e.g. verbal, visual, auditory, and tactile) that can form a narrative or be used to construct a narrative.

Textons

Strings of signs as they exist in the text. In other words, they are the information or signs stored in the text, the ‘raw material’ that have not been rearranged in any way to show to the interpreter in the material medium.

Traverse

The action of the interpreter to travel through the narrative content. Such an action is restrained by the rules of the storytelling mechanism which may or may not require necessary physical operations on the part of the interpreter.

Unstable medium

Something or someone that is not consistent in terms of its/her/his/their performance(s).

References

Primary sources

Codices:

Ahlberg, J. and Ahlberg, A. 1986. *The Jolly Postman: or Other People's Letters*. London: Heinemann.

Banyai, I. 1995a. *Re-Zoom*. New York: PuffinViking.

Banyai, I. 1995b. *Zoom* Hardcover. Viking.

Barrie, J.M. 2015. *Peter Pan*. New York: Harper Design.

Carroll, L. 1865. *Alice's Adventures in Wonderland* 1st ed. London: Macmillan.

Godeau, V. 2014. *Avec quelques briques*. Paris: L'Agrume.

Hutchins, P. 1970. *Rosie's Walk*. Harmondsworth: Puffin.

Jeffers, O. 2010. *The Heart and the Bottle*. London, HarperCollins Children's Books.

Johnson, B.S. 1969. *The Unfortunates*. London: Panther.

Jovanovic, K. and Béha, P. 2008. *The King Has Goat Ears*. Vancouver: Tradewind Books.

Livingstone, I. and Jackson, S. 1982. *Fighting Fantasy*. Puffin: Puffin Books.

Miles, M. 2014. *The Lonely Crow*. Me Books.

Pavić, M. 1992. *Landscape Painted with Tea*. London: Penguin.

Saint-Exupéry, A. de 2009. *Le Petit Prince* Le Grand Livre Pop-Up. France: Gallimard Jeunesse.

Tan, S. 2007. *The Arrival*. London: Hodder Children's Books.

Tan, S. 2011. *The Lost Thing*. Melbourne: Lothian.

Digital texts:

Alice for the iPad. 2015 [2010]. Atomic Antelope. iOS. Version 4.0.

Amanita Design. 2015. *Machinarium*. Android; Windows; OS X; Linux. Version 2.0.39.

Axel Scheffler's Flip Flap Jungle. 2017 [2015]. Nosy Crow. iOS. Version 1.2.

Cinderella. 2016 [2011]. Nosy Crow. iOS. Version 2.0.0.

David Wiesner's Spot. 2015 [2015]. Houghton Mifflin Harcourt. Version 1.1.

Dino Tales. 2016 [2015]. Kuato Studios. iOS. Version 1.7.1.

Hat Monkey. 2016 [2014]. Fox and Sheep. iOS. Version 1.7.

How Far is Up?. 2014 [2014]. Sargeant, B. iOS. Version 1.2.

In My Dream. 2014 [2012]. e-Toiles éditions. iOS. Version 1.3.1.

Jack and the Beanstalk. 2017 [2014]. Nosy Crow. iOS. Version 1.2.

Lil' Red -- An Interactive Story. 2013 [2012]. Main, B. iOS. Version 1.0.3.

Little Red Riding Hood. 2017 [2013]. Nosy Crow. iOS. Version 1.2.

Love, the App. 2014 [2014]. Pablo Curti. iOS. Version 1.0.2.

Mateas, M. and Stern, A. 2005. *Façade*. Procedural Arts. Windows, Macintosh operating systems.

Me Books -- Books, Comics and Bedtime Stories for Kids. 2015 [2012]. Me Books. iOS. Version 2.2.

Pierrot Pierrette. 2015 [2015]. Audois & Alleuil Editions/Gouny, N. Android; iOS. Version 1.3.0.

Snow White. 2017 [2015]. Nosy Crow. iOS. Version 1.2.

SOS Dinos in Distress. 2013 [2013]. Audois & Alleuil Editions. Android; iOS. Version 1.0.

The Cat in the Hat. 2010 [2010]. Oceanhouse Media. Android; iOS. Version 1.0.

The Fantastic Flying Books of Mr. Morris Lessmore. 2015 [2011]. Moonbot Studios. iOS. Version 1.4.5.

The Great Ghost Chase. 2014 [2014]. Audois & Alleuil Editions. Android; iOS. Version 1.0.

The Heart and the Bottle for iPad. 2010 [2010]. HarperCollins Publishers Ltd. iOS. Version 1.0.

The Icky Mr Fox. 2016 [2012]. ICKYPEN. Android; iOS. Version 6.0.

The King's Ear. 2016 [2016]. Rascal Media. iOS. Version 1.0.

The Monster at the End of this Book. Sesame Street. 2014 [2011]. Sesame Street. iOS. Version 5.1.

The Numberlys. 2012 [2012]. Moonbot Studios. iOS. Version 1.0.8.

The Nuton's Kitchen or How to Nurture a Gnome. 2016 [2012]. Des Carabistouilles SPRL. iOS. Version 1.3.

The Ogress. 2012 [2012]. La Souris Qui Raconte. Android; iOS. Version 1.2.0.

The Poppin Princess. 2013 [2013]. Audois & Alleuil Editions. Android; iOS. Version 1.0.

The Three Little Pigs. 2016 [2011]. Nosy Crow. iOS. Version 2.0.0.

With a Few Bricks. 2016 [2015]. Christian de Wit. iOS. Version 1.2.

Wuwu & Co. - A Magical Picture Book. Step In Books. 2017 [2014]. Step in Books. iOS. Version 1.8.

Secondary sources

Aarseth, E. 1991. *Texts of Change. Towards a Poetics of Nonlinearity*. Bergen: University of Bergen.

Aarseth, E.J. 1997. *Cybertext: Perspectives on Ergodic Literature*. Baltimore: JHU Press.

Aarseth, E.J. 1994. Nonlinearity and Literary Theory *In*: G. P. Landow, ed. *Hyper/Text/Theory*. Baltimore, MA: Johns Hopkins University Press, pp. 51–86.

Adami, E. and Kress, G. 2014. Introduction: Multimodality, Meaning Making, and the Issue of 'Text'. *Text & Talk*. **34**(3), pp. 231–237.

Adams, E. 2014. *Fundamentals of Game Design* Third Edition. Berkeley, California: New Riders.

Aguilera, E., Kachorsky, D., Gee, E. and Serafini, F. 2016. Expanding Analytical Perspectives on Children's Picturebook Apps. *Literacy Research: Theory, Method, and Practice*. **65**(1), pp.421–435.

Aliagas, C. and Margallo, A.M. 2017. Children's Responses to the Interactivity of Storybook Apps in Family Shared Reading Events Involving the iPad. *Literacy*. **51**(1), pp.44–52.

Al-Yaqout, G. 2011. From Slate to Slate: What does the Future Hold for the Picturebook Series? *New Review of Children's Literature and Librarianship*. **17**(1), pp.57–77.

Al-Yaqout, G. and Nikolajeva, M. 2015. Re-Conceptualising Picturebook Theory in the Digital Age. *BLFT-Nordic Journal of ChildLit Aesthetics*. [Online]. **6**. [Accessed 12 October 2015]. Available from: http://www.childlitaesthetics.net/index.php/blft/article/view/26971.

Anon 2017a. application, n. *OED Online*. [Online]. Available from: http://www.oed.com/view/Entry/9705.

Anon 2017b. interact, v. *OED Online*. [Online]. [Accessed 25 January 2017]. Available from: http://www.oed.com/view/Entry/97518.

Anon 2017c. interaction, n. *OED Online*. [Online]. [Accessed 25 January 2017]. Available from: http://www.oed.com/view/Entry/97519.

Anon 2017d. interactive, adj. *OED Online*. [Online]. [Accessed 20 January 2017]. Available from: http://www.oed.com/view/Entry/97521.

Anon 2012. Mode. *Glossary of multimodal terms*. [Online]. [Accessed 13 February 2018]. Available from: https://multimodalityglossary.wordpress.com/mode-2/.

Anon n.d. Terms and Agreements - Apple Developer. [Accessed 5 July 2016]. Available from: https://developer.apple.com/terms/.

Arizpe, E. and Smith, V. (eds.). 2016. *Children as Readers in Children's Literature: The Power of Texts and the Importance of Reading*. London: Routledge.

Arizpe, E. and Styles, M. 2016. *Children Reading Picturebooks: Interpreting Visual Texts* 2nd ed. Routledge.

Bader, B. 1976. *American Picturebooks from Noah's Ark to the Beast Within*. New York: Macmillan.

Bal, M. 1985. *Narratology: Introduction to the Theory of Narrative*. Toronto; London: University of Toronto Press.

Bal, M. 2009. *Narratology: Introduction to the Theory of Narrative* 3rd ed. Toronto, Ont.; London: University of Toronto Press.

Bal, M. and Boheemen-Saaf, C. van 2009. *Narratology: Introduction to the Theory of Narrative* 3rd ed. Toronto, Ont.; London: University of Toronto Press.

Barry, M. and Doherty, G. 2016. What We Talk about When We Talk about Interactivity: Empowerment in Public Discourse. *New Media & Society*., pp.1–20.

Barthes, R. and Duisit, L. 1975. An Introduction to the Structural Analysis of Narrative. *New literary history*. **6**(2), pp.237–272.

Bartle, R.A. 2003. *Designing Virtual Worlds*. Indianapolis, IN.: New Riders Pub.

Beckett, S.L. 2012. *Crossover Picturebooks: A Genre for All Ages*. New York; London: Routledge.

Bircher, K. 2012. What Makes a Good Picture Book App? *The Horn Book*. [Online]. [Accessed 5 June 2017]. Available from: http://www.hbook.com/2012/02/using-books/what-makes-a-good-picture-book-app/.

Bird, E. 2011. Planet App: Kids' Book Apps Are Everywhere. But Are They Any Good? *School Library Journal*. **57**(1), pp.26–31.

Bretz, R. and Schmidbauer, M. 1983. *Media for Interactive Communication*. Beverly Hills, London, New Delhi: SAGE.

Bryan, E. 2013. Making Story Apps -- The Art of Little Red Riding Hood. [Accessed 3 July 2017]. Available from: https://www.slideshare.net/edatnosycrow/pres-for-slideshare2.

Buckleitner, W. 2015. *Child Development 101 for Interactive Media Designers: n Overview of Influential Theories, Applied to Practice* [Online]. United States of America: Children's Technology Review. [Accessed 22 July 2017]. Available from: http://dustormagic.com/wp-content/uploads/2016/03/childdev101-2016mc.pdf.

Bucy, E.P. 2004. Interactivity in Society: Locating an Elusive Concept. *The information society*. **20**(5), pp.373–383.

Bullock, R.M. 2010. Enhanced Ebook and Enhanced Ebook Reader. [Accessed 27 February 2016]. Available from: https://www.google.com/patents/US20110261030.

Bus, A.G., Takacs, Z.K. and Kegel, C.A. 2015. Affordances and Limitations of Electronic Storybooks for Young Children's Emergent Literacy. *Developmental Review*. **35**, pp.79–97.

Chatman, S. 1975. Towards A Theory of Narrative. *New Literary History*. **6** (2, On Narrative and Narratives), pp.295–318.

Colombo, L., Landoni, M. and Rubegni, E. 2012. Understanding Reading Experience to Inform the Design of Ebooks for Children *In*: *Proceedings of the 11th International Conference on Interaction Design and Children* [Online]. ACM, pp. 272–275. [Accessed 27 February 2016]. Available from: http://dl.acm.org/citation.cfm?id=2307143.

Colwell, E.H. 1980. *Storytelling*. London: Bodley Head.

Cover, R. 2016. *Digital Identities: Creating and Communicating the Online Self*. Amsterdam; Boston: Academic Press/Elsevier.

Dhar, V.P. 2012. *The Art of Movie Making: A Complete Handbook of Film Techniques & Terminology*. Jaipur: Yking Books.

Dinicola, N. 2013. The Problem with Emergent Stories in Video Games. *PopMatters*. [Online]. [Accessed 17 May 2017]. Available from: http://www.popmatters.com/column/173580-the-problem-with-emergent-stories-in-video-games/.

Doonan, J. 1986. The Object Lesson: Picturebooks of Anthony Browne. *Word & Image*. **2**(2), pp.159–172.

Downes, E.J. and McMillan, S.J. 2000. Defining Interactivity: A Qualitative Identification of Key Dimensions. *New media & society*. **2**(2), pp.157–179.

Durham, M.G. and Kellner, D.M. 2012. *Media and Cultural Studies: Keyworks*. Malden, MA; Oxford: Wiley-Blackwell.

Eskelinen, M. 2012. *Cybertext Poetics: The Critical Landscape of New Media Literary Theory*. New York: The Continuum International Publishing Group.

Eskelinen, M. 2001. Cybertext Theory and Literary Studies: A User's Manual. *Ebr12 MSN: Music Sound Noise*. [Online]. [Accessed 25 August 2015]. Available from: http://www.altx.com/ebr/ebr12/eskel.htm.

Fludernik, M. 2009. *An Introduction to Narratology*. London: Routledge.

Frederico, A. 2016. The Future of the Reader or the Reader of the Future: Children's Interactive Picturebook Apps and Multiliteracies. *Cadernos de Letras da UFF*. **26**, pp.121–139.

Garrish, M. 2011. *What is EPUB 3?* [Online]. O'Reilly Media, Inc. [Accessed 26 February 2016]. Available from: https://books.google.co.uk/books?hl=en&lr=&id=yM6SYIRnFpMC&oi=fnd&pg=PA8&dq=what+is+epub&ots=C-XYkqTAnD&sig=UW_hQlu-Q3pXulLNAG6CEUXSgdE.

Genette, G. 1988. *Narrative Discourse Revisited*. Ithaca, N.Y.: Cornell University Press.

Genette, G. 1997. *Paratexts: Thresholds of Interpretation*. Cambridge: Cambridge University Press.

Grenby, M.O. 2011. *The Child Reader, 1700-1840*. Cambridge: Cambridge University Press.

Griffey, J. 2010. Chapter 2: Electronic Book Readers. *Library Technology Reports*. **46**(3), pp.7–19.

Gronseth, S. 2015. *Games as Lit. 101 - Emergent Narrative* [Online]. [Accessed 17 May 2017]. Available from: https://www.youtube.com/watch?v=_tvvgRvxbWI&t=5s.

Hahn, H. 1996. *The Internet Complete Reference* 2nd ed. Berkeley: Osborne McGraw-Hill.

Hayles, N.K. 2007. Electronic Literature: What is it? [Accessed 1 April 2017]. Available from: http://eliterature.org/pad/elp.html.

Hayles, N.K. 2016. Electronic Literature: What is It? *In*: C. Crompton, R. J. Lane and R. Siemens, eds. *Doing Digital Humanities: Practice, Training, Research*. London; New York: Routledge, pp. 197–226.

Hayles, N.K. 2001. What Cybertext Theory Can't Do. *Electronic Book Review*. [Online]. [Accessed 5 December 2016]. Available from: http://www.altx.com/ebr/riposte/rip12/rip12hay.htm.

Hayles, N.K. 2002. *Writing Machines*. Cambridge, Mass.; London: MIT Press.

Hoffman, J.L. and Paciga, K.A. 2014. Click, Swipe, and Read: Sharing E-books with Toddlers and Preschoolers. *Early Childhood Education Journal*. **42**(6), pp.379–388.

Hourcade, J.P., Williams, S.R., Miller, E.A., Huebner, K.E. and Liang, L.J. 2013. Evaluation of Tablet Apps to Encourage Social Interaction in Children with Autism Spectrum Disorders *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing*

Systems [Online]. ACM, pp. 3197–3206. Available from: http://dl.acm.org/citation.cfm?id=2466438.

Hunt, P. 1991. *Criticism, Theory, and Children's Literature*. Oxford: Blackwell.

Jarvis, R.A. and Zelinsky, A. (eds.). 2003. *Robotics Research: The Tenth International Symposium* [Online]. Springer. [Accessed 15 February 2017]. Available from: https://books.google.com/books?hl=en&lr=&id=WvhsCQAAQBAJ&oi=fnd&pg=PA4&dq=robotics+research+The+Tenth+International+Symposium&ots=3lRvDVKePI&sig=WcO_y4p-aMWdzzRMvFIaJ3Q7CVE.

Jensen, J.F. 1998. 'Interactivity'. Tracking a New Concept in Media and Communication Studies. *Nordicom Review*. (1), pp.185–204.

Jewitt, C., Bezemer, J. and O'Halloran, K. 2016. *Introducing Multimodality* 1st ed. Oxon; New York: Routledge.

Kayany, J.M., Wotring, C.E. and Forrest, E.J. 1996. Relational Control and Interactive Media Choice in Technology-Mediated Communication Situations. *Human Communication Research*. **22**(3), pp.399–421.

Kiousis, S. 2002. Interactivity: a concept explication. *New Media & Society*. **4**(3), pp.355–383.

Kirkus Review 2013. THE POPPIN PRINCESS. *Kirkus Reviews*. [Online]. (April 1st, 2013). [Accessed 17 July 2017]. Available from: https://www.kirkusreviews.com/book-reviews/leila-brient/poppin-princess/.

Kress, G.R. and Van Leeuwen, T. 2001. *Multimodal Discourse: The Modes and Media of Contemporary Communication*. London: New York: Arnold; Oxford University Press.

Kress, G.R. and Van Leeuwen, T. 1996. *Reading Images: The Grammar of Visual Design* 1st ed. London: Routledge.

Kress, G.R. and Van Leeuwen, T. 2006. *Reading Images: The Grammar of Visual Design* 2nd ed. London: Routledge.

Kwastek, K. 2008. Interactivity–A Word in Process *In*: Schrista Sommerer, L. C. Jain and L. Mignonneau, eds. *The Art and Science of Interface and Interaction Design*. Springer, pp. 15–26.

Leadbetter, C., Greig, P. and Rouse, G. 2008. *OCR Computing for A Level*. Hodder Education Group.

LeBlanc, M. 2000. Formal Design Tools: Emergent Complexity, Emergent Narrative *In*: *Proceedings of the 2000 Game Developers' Conference*. San Jose, CA.

Lewis, D. 1996. Pop-Ups and Fingle-Fangles: The History of the Picture Books *In*: V. Watson and M. Styles, eds. *Talking Pictures: Pictorial Texts and Young Readers*. London: Hodder & Stoughton, pp. 5–22.

Liang, H.-N., Parsons, P.C., Wu, H.-C. and Sedig, K. 2010. An Exploratory Study of Interactivity in Visualization Tools: 'Flow'of Interaction. *Journal of Interactive Learning Research*. **21**(1), pp.5–45.

Lopes, D.M.M. 2001. The Ontology of Interactive Art. *Journal of Aesthetic Education*. **35**(4), pp.65–81.

Luesebrink, M. 2001. Of Tea Cozy and Link. *Electronic Book Review*. [Online]. (11). [Accessed 4 April 2017]. Available from: http://www.altx.com/ebr/riposte/rip11/rip11cov.htm.

Mackey, M. 2015. Digital Picturebooks *In*: E. Arizpe and M. Styles, eds. *Children Reading Picturebooks: Interpreting Visual Texts*. London: Routledge, pp. 169–179.

Mackey, M. 2007. *Literacies across Media: Playing the Text* 2nd ed. London; New York: Routledge.

Manovich, L. 2001. *The Language of New Media* 1st MIT Press pbk. ed. Cambridge, Mass: MIT Press.

Manresa, M. and Real, N. (eds.). 2015. *Digital Literature for Children: Texts, Readers and Educational Practices*. Brussels: P.I.E. Peter Lang.

McLuhan, M. 1994. *Understanding Media: The Extensions of Man*. MIT press.

McQuail, D. 2010. *Mass Communication Theory* 6th ed. London: SAGE.

Meek, M. 1988. *How Texts Teach What Readers Learn*. Stroud: Thimble Press.

Miller, C.H. 2004. *Digital Storytelling: A Creator's Guide to Interactive Entertainment*. Boston: Elsevier.

Montfort, N. 2000. Cybertext Killed the Hypertext Star. *Electronic Book Review*. [Online]. (11). [Accessed 24 August 2016]. Available from: http://www.electronicbookreview.com/thread/electropoetics/cyberdebates.

Murdock, L.C., Ganz, J. and Crittendon, J. 2013. Use of an iPad Play Story to Increase Play Dialogue of Preschoolers with Autism Spectrum Disorders. *Journal of autism and developmental disorders*. **43**(9), pp.2174–2189.

Murray, J.H. 1998. *Hamlet on the holodeck*. Cambridge MA: MIT Press.

Nakevska, M., van der Sanden, M.J., Funk, M., Hu, J. and Rauterberg, G.W.M. 2017. Interactive Storytelling in a Mixed Reality Environment. [Accessed 25 January 2017]. Available from: http://repository.tue.nl/759a9315-8b34-4890-b9b3-3d0ad106b1d0.

Nikolajeva, M. 2005. *Aesthetic approaches to children's literature: an introduction*. Lanham, Md.; Oxford: Scarecrow Press.

Nikolajeva, M. 2014. *Reading for Learning: Cognitive Approaches to Children's Literature*. Amsterdam: John Benjamins Publishing Company.

Nikolajeva, M. 2002. *The Rhetoric of Character in Children's Literature*. Scarecrow Press.

Nikolajeva, M. and Scott, C. 2001. *How Picturebooks Work*. New York: Routledge.

Nikolajeva, M. and Scott, C. 2006. *How picturebooks work*. New York, NY: Routledge.

Nodelman, P. 2008. *The hidden adult: defining children's literature*. Baltimore, Md: Johns Hopkins University Press.

Nodelman, P. 1988a. *Words about Pictures: The Narrative Art of Children's Picture Books*. University of Georgia Press.

Nodelman, P. 1988b. *Words about Pictures: The Narrative Art of Children's Picture Books*. Athens, Ga.; London: University of Georgia Press.

Nugent, C. 2017. Classroom Testing. *Rascal Media*. [Online]. [Accessed 28 June 2017]. Available from: https://rascalmedia.com/the-kings-ears/classroom-testing/.

Nugent, C. 2016. Tenets of Selected Picturebook Scholarship Applied to the Practice of the Adaptation of the Picturebook, the King Has Goat Ears, to a Picturebook App. [Accessed 3 July 2017]. Available from: https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0300128.

Nuttall, E. 2017. Truly Digital Books Require Truly Digital Thinking. *The Bookseller*. [Online]. [Accessed 9 September 2017]. Available from: http://www.thebookseller.com/futurebook/future-books-can-only-come-deep-knowledge-digital-culture-631036.

Pattison, D. 2013. *How to Write a Children's Picture Book*. Mims House.

Porter, T.A. 2003. Aarseth's Scriptons and Gunder's Content Spaces: Perspective and the Analysis of Textual Systems A. Miles, ed. *MelbourneDAC: MelbourneDAC 2003 Streamingworlds: 5th International Digital Arts & Culture Conference RMIT University, School of Applied Communication, Melbourne, Australia, May 2003*., p.216.

Prensky, M. 2001. Digital Natives, Digital Immigrants Part 1. *On the horizon*. **9**(5), pp.1–6.

Pullinger, K. and Joseph, C. 2005. *Inanimate Alice: Episode 1* [Online]. [Accessed 8 April 2017]. Available from: http://www.inanimatealice.com.

Punday, D. 2011. From Synesthesia to Multimedia: How to Talk about New Media Narrative *In*: R. Page and B. Thomas, eds. *New Narratives: Stories and Storytelling in the Digital Age*. Lincoln; London: University of Nebraska Press, pp. 19–34.

Raessens, J. and Goldstein, J. 2011. *Handbook of Computer Game Studies* [Online]. Cambridge, Mass.; London: MIT Press. [Accessed 24 April 2017]. Available from: http://dl.acm.org/citation.cfm?id=2073637.

Rafaeli, S. 1988. Interactivity: From New Media to Communication. *Sage annual review of communication research: Advancing communication science*. **16**, pp.110–134.

Rafaeli, S. and Sudweeks, F. 1997. Networked Interactivity. *Journal of Computer-Mediated Communication*. **2**(4), pp.1–17.

Rafferty, T. 2003. Everybody Gets a Cut. *The New York Times Magazine*., pp.58–61.

Rayner, P., Wall, P. and Kruger, S. 2001. *Media Studies: The Essential Introduction*. London: Routledge.

Rettberg, S. 2001. The Pleasure (and Pain) of Link Poetics. *Electronic Book Review*. [Online]. (12). Available from: http://www.altx.com/ebr/riposte/rip12/rip12ret.htm.

Reynolds, K. 2016. *Left Out: The Forgotten Tradition of Radical Publishing for Children in Britain 1910–1949*. Oxford University Press.

Rogers, E.M. 1995. *Diffusion of Innovations* 4th ed. New York: Free Press.

Ross, E.A. 1908. *Social Psychology: An Outline and Source book*. New York: Macmillan.

Rouse, G., Pitt, J. and O'Byrne, S. 2015. *OCR A Level Computer Science*. Hachette UK.

Ryan, M.-L. 2006. *Avatar of Story*. Minneapolis: University of Minnesota Press.

Ryan, M.-L. 2014. Narration in Various Media *In*: P. Hühn, J. C. Meister, J. Pier and W. Schmid, eds. *Handbook of Narratology*. Berlin/Boston: Walter de Gruyter GmbH & Co KG, pp. 468–488.

Ryan, M.-L. (ed.). 2004. *Narrative across Media: The Languages of Storytelling*. Lincoln: U of Nebraska Press.

Ryan, M.-L. 2015. *Narrative as Virtual Reality 2: Revisiting Immersion and Interactivity in Literature and Electronic Media*. Baltimore: Johns Hopkins University Press.

Ryan, M.-L. 2001. *Narrative as Virtual Reality: Immersion and Interactivity in Literature and Electronic Media*. Baltimore: Johns Hopkins University Press.

Salisbury, M. 2004. *Illustrating Children's Books*. London: A & C Black.

Salisbury, M. and Styles, M. 2012. *Children's Picturebooks: The Art of Visual Storytelling*. Laurence King Pub.

Saltz, D.Z. 1997. The Art of Interaction: Interactivity, Performativity, and Computers. *The Journal of Aesthetics and Art Criticism*. **55**(2), pp.117–127.

Sargeant, B. 2013. Interactive Storytelling: How Picture Book Conventions Inform Multimedia Book App Narratives. *Australian Journal of Intelligent Information Processing Systems*. **13**(3), pp.29–35.

Sargeant, B. 2015. What is an ebook? What is a Book App? And Why Should We Care? An Analysis of Contemporary Digital Picture Books. *Children's Literature in Education*. **46**(4), pp.454–466.

Saussure, F. de 1983. *Course in General Iinguisitics* 1st ed. London: Gerald Duckworth & Co. Ltd.

Schugar, H.R., Carol A. Schugar. Jordan T., Smith, C.A. and Schugar, J.T. 2013. Teaching with Interactive Picture E-Books in Grades K-6. *Reading Teacher*. **66**(8), pp.615–624.

Schwebs, T. 2014. Affordances of an App-A reading of the Fantastic Flying Books of Mr. Morris Lessmore. *BLFT-Nordic Journal of ChildLit Aesthetics*. [Online]. **5**. [Accessed 12 October 2015]. Available from: http://www.childlitaesthetics.net/index.php/blft/article/view/24169.

Sedig, K. and Liang, H.-N. 2006. Interactivity of Visual Mathematical Representations: Factors Affecting Learning and Cognitive Processes. *Journal of Interactive Learning Research*. **17**(2), p.179.

Sedig, K., Parsons, P. and Babanski, A. 2012. Towards a Characterization of Interactivity in Visual Analytics. *JMPT*. **3**(1), pp.12–28.

Seifert, U., Kim, J.H. and Moore, A. 2008. *Paradoxes of Interactivity: Perspectives for Media Theory, Human-Computer Interaction, and Artistic Investigations*. Bielefeld: New Brunswick [N.J.]: Transcript; Distributed in North America by Transaction Publishers.

Serafini, F., Kachorsky, D. and Aguilera, E. 2016. Picture Books in the Digital Age. *The Reading Teacher*. **0**(0), pp.1–4.

Serafini, F., Kachorsky, D. and Aguilera, E. 2015. Picturebooks 2.0: Transmedial Features Across Narrative Platforms. *Journal of Children's Literature*. **41**(2), pp.16–24.

Simon, B., Massart, D., Van Assche, F., Ternier, S., Duval, E., Brantner, S., Olmedilla, D. and Miklós, Z. 2005. A Simple Query Interface for Interoperable Learning Repositories *In*: *Proceedings of the 1st Workshop on Interoperability of Web-based Educational Systems* [Online]. CEUR, pp. 11–18. [Accessed 2 March 2017]. Available from: https://lirias.kuleuven.be/handle/123456789/134255.

Sipe, L.R. 1998. How picture books work: A semiotically framed theory of text-picture relationships. *Children's Literature in Education*. **29**(2), pp.97–108.

Sipe, L.R. 2001. Picturebooks as Aesthetic Objects. *Literacy, Teaching and Learning*. **6**(1), p.23.

Sipe, L.R. 2008. *Storytime: young children's literary understanding in the classroom*. New York, NY; London: Teachers College Press.

Sipe, L.R. and McGuire, C.E. 2006. Picturebook endpapers: Resources for Literary and Aesthetic Interpretation. *Children's literature in Education*. **37**(4), pp.291–304.

Sipe, L.R. and Pantaleo, S.J. (eds.). 2008. *Postmodern picturebooks: play, parody, and self-referentiality*. New York; London: Routledge.

Smeets, D.J.H. and Bus, A.G. 2015. The Interactive Animated E-book as a Word Learning Device for Kindergartners. *Applied Psycholinguistics*. **36**(04), pp.899–920.

Smuts, A. 2009. What is Interactivity? *The Journal of Aesthetic Education*. **43**(4), pp.53–73.

Solomon, A. 2015. Pierrot Pierrette Review | 148Apps. *148Apps.com*. [Online]. [Accessed 17 July 2017]. Available from: http://www.148apps.com/reviews/pierrot-pierrette-review/.

Stephenson, C. 2002. Eileen Colwell. *The Guardian*. [Online]. [Accessed 7 March 2017]. Available from: https://www.theguardian.com/news/2002/sep/25/guardianobituaries.obituaries.

Steuer, J. 1992. Defining Virtual Reality: Dimensions Determining Telepresence. *Journal of communication*. **42**(4), pp.73–93.

Stichnothe, H. 2014. Engineering stories? A narratological approach to children's book apps. *BLFT-Nordic Journal of ChildLit Aesthetics*. [Online]. **5**. [Accessed 24 August 2015]. Available from: http://journals.co-action.net/index.php/blft/article/view/23602.

Sundar, S.S. 2007. Social Psychology of Interactivity in Human-Website Interaction *In*: A. N. Joinson, K. Y. A. McKenna, T. Postmes and U.-D. Reips, eds. *The Oxford Handbook of Internet Psychology*. Oxford: Oxford University Press, pp. 89–102.

Sundar, S.S., Jia, H., Waddell, T.F. and Huang, Y. 2015. Toward a Theory of Interactive Media Effects (TIME): Four Models for Explaining How Interface Features Affect User Psychology *In*: S. S. Sundar, ed. *The Handbook of the Psychology of Communication Technology*. West Sussex: John Wiley & Sons.

Svanæs, D. 2000. *Understanding Interactivity: Steps to a Phenomenology of Human-Computer Interaction*. Norges teknisk-naturvitenskapelige universitet (NTNU), Institutt for datateknikk og informasjonsvitenskap.

Todorov, T. 1977. *The Poetics of Prose*. Oxford: Blackwell.

Transbook, Children's Literature on the Move 2015. *EN - Warren Buckleitner at the From Paper to Screen Conference 2015* [Online]. Montreuil, France. Available from: https://www.youtube.com/watch?v=Oee_R_mKrjg.

Tripathi, K.P. 2011. A Study of Interactivity in Human Computer Interaction. *International Journal of Computer Applications*. **16**(6), pp.1–3.

Turrión, C. 2015. Electronic Literature for Children: Characterising Narrative Apps (2010-2014) *In*: M. Manresa and N. Real, eds. *Digital Literature for Children: Texts, Readers and Educational Practices*. Brussels: P.I.E. Peter Lang, pp. 87–102.

Turrión, C. 2014. Multimedia Book Apps in a Contemporary Culture: Commerce and Innovation, Continuity and Rupture. *BLFT-Nordic Journal of ChildLit Aesthetics*. **5**.

Vassiliou, M. and Rowley, J. 2008. Progressing the Definition of 'e-book'. *Library Hi Tech*. **26**(3), pp.355–368.

Walsh, R. 2011. Emergent narrative in interactive media. *Narrative*. **19**(1), pp.72–85.

Wardrip-Fruin, N. 2009. *Expressive Processing: Digital Fictions, Computer Games, and Software Studies*. Cambridge, Mass.; London: MIT Press.

Wardrip-Fruin, N. and Harrigan, P. (eds.). 2004. *First Person: New Media as Story, Performance, and Game*. Cambridge, Mass., London: MIT Press.

Wardrip-Fruin, N. and Harrigan, P. (eds.). 2007. *Second Person: Role-Playing and Story in Games and Playable Media* [Online]. Cambridge, Mass., London: The MIT Press.

Wardrip-Fruin, N. and Harrigan, P. (eds.). 2009. *Third Person: Authoring and Exploring Vast Narratives* [Online]. Cambridge, Mass., London: The MIT Press. [Accessed 15 February 2017]. Available from: http://dl.acm.org/citation.cfm?id=1462126.

Wiener, N. 1948. *Cybernetics: Or, Control and Communication in the Animal and the Machine.* New York: John Wiley & Sons.

Wikert, J. 2012. HTML5, EPUB 3, and Ebooks vs. Web Apps. *O'REILLY Tools of Change for Publishing*. [Online]. Available from: http://toc.oreilly.com/2012/09/html5-epub-3-and-ebooks-vs-web-apps.html.

Williams, F., Rice, R.E. and Rogers, E.M. 1988. *Research Methods and the New Media*. New York: Free Press.

Wolf, S.A. 2014. Children's Literature on the Digital Move. *The Reading Teacher*. **67**(6), pp.413–417.

Wooten, D.A. and McCuiston, K.F. 2015. Children's Literature Book Apps: Exploring New Paths for Books and Literacy Development. *Journal of Children's Literature*. **41**(2), pp.26–30.

Yokota, J. 2013. From Print to Digital? Considering the Future of Picture Books for Children *In*: *Bologna: Fifty Years of Children's Books from around the World*. Bologna: BOlogna University Press, pp. 443–449.

Yokota, J. 2015. The Past, Present, and Future of Digital Picturebooks for Children. *In*: M. Manresa and N. Real, eds. *Digital Literature for Children: Texts, Readers and Educational Practices* [Online]. Brussels, Belguim: Peter Lang, pp. 73–86.

Yokota, J. 2012. What Words Well Where? Considering Books for Children in Different Formats *In*: Bologna, Italy.

Yokota, J. and Teale, W.H. 2014. Picture Books and the Digital World: Educators Making Informed Choices. *The Reading Teacher*. **67**(8), pp.577–585.

Zhao, S. and Unsworth, L. 2016. Touch Design and Narrative Interpretation: A Social Semiotic Approach to Picture Book apps *In*: N. Kucirkova and G. Falloon, eds. *Apps, Technology and Younger Learners*. Routledge, pp. 87–98.

Zheng, Y. 2016. Anything New Here in Story Apps? A Reflection on the Storytelling Mechanism. *Libri & Liberi*. **5**(1), pp.55–76.

Zheng, Y. 2018. Storytelling Mechanism 2.0: Another Perspective on Digital Literature. *Libri & Liberi*. **7**(1) [in press]

Appendices

Appendix A: A Selected List of Narrative Apps

App Title	Publisher	Operating System
Le prénom du monde	La Souris Qui Raconte	Android
A Fine Musician	The Trustee for the Tokeru Trust	iOS
Alice for the iPad	Atomic	iOS
Auschwitz, a Tale of Wind	II Paragrafo	iOS
Axel Scheffler's Flip Flap Jungle	Nosy Crow	iOS
Axel Scheffler's Flip Flap Safari	Nosy Crow	iOS
Billy's Booger Storybook	Moonbot Studios	iOS
Blue Hat, Green Hat	Loud Crow Interactive Inc.	iOS
Boum!	Les Inéditeurs	Android/iOS
Chabada	La Souris Qui Raconte	Android
Cinderella	Nosy Crow	iOS
Conte du haut de mon crâne	La Souris Qui Raconte	Android/iOS
Dagobert et sa famille à l'envers	La Souris Qui Raconte	Android
David Wiesner's Spot	Houghton Mifflin Harcourt	iOS
Emma Loves Pink	WingedChariot Press	iOS
Epic!	Epic! App	iOS
Even Monsters Get Sick	Busy Bee Studios	iOS
Fairytale Play Theatre	Nosy Crow	iOS
Flamboyant le courageux	La Souris Qui Raconte	Android
Goldilocks and Little Bear	Nosy Crow	iOS
Good Night Dada	Elastico	iOS
Hat Monkey	Fox and Sheep GmbH	iOS
How Far is Up	E Sargeant	iOS
How Rocket Learned to Read	Random House LLC	iOS
Il suffit parfois d'un cygne	La Souris Qui Raconte	Android
In my Dream	e-Toiles Editions	iOS
Jack and the Beanstalk	Nosy Crow	iOS
Je suis le nombril du monde	La Souris Qui Raconte	Android

La grosse tête de Magior	La Souris Qui Raconte	Android
La machine aux illusions	La Souris Qui Raconte	Android/iOS
La princesse aux pieds nus	La Souris Qui Raconte	Android
Lars and Friends	Carla Susanto	iOS
Le drôle de chat qui mord	La Souris Qui Raconte	Android
Le livre papillon	La Souris Qui Raconte	Android/iOS
Le prince de Venise	La Souris Qui Raconte	Android
Léon et le géant	La Souris Qui Raconte	Android
Les deux rois, la sorcière et le sage	La Souris Qui Raconte	Android
Lil' Red – An Interactive Story	Brain Main	Android/iOS
Little Red Riding Hood	Nosy Crow	iOS
Loose Strands	Darned Socks Productions	Android/iOS
Love, The App	Pablo Curti	iOS
Lucy & Pogo - Play, Listen and Learn	catsndogz gbr	iOS
Ma rentrée colère	La Souris Qui Raconte	Android
Meet Biscuit	iStoryTime Inc.	iOS
Midnight Feast	Slap Happy Larry	iOS
Mon ami crocodile	La Souris Qui Raconte	Android
Mr Fox and Mr Rabbit	ICKYPEN	iOS
Mur	Step in Books	iOS
My Little Cook: Cucino Ottimi Spuntini	gradoZero	Amazon/Android/ iOS
My Very Hungry Catepillar	StoryToys	iOS
Nasreddine Hodja et Parabole le chat	La Souris Qui Raconte	Android
Nasreddine Hodja et Parabole le chat 2	La Souris Qui Raconte	Android
Nickelby Swift, Kitten Catastrophe	VivaBook™	iOS
Nighty Night! - The Bedtime Story App for Children	Fox and Sheep GmbH	iOS
PCR Company	La Souris Qui Raconte	Android
Petting Zoo – Animal Animations	Fox and Sheep GmbH	iOS
Pierre et le loup	Camera Lucida	iOS
Pierrot Pierrette	Audois & Alleuil Editions	Amazon/Android/ iOS
Polo le clodo	La Souris Qui Raconte	Android
Pour tout l'or du monde	La Souris Qui Raconte	Android
Quem soltou o pum?	Amendments Editora Schwarz	iOS
Rumpelstiltskin	Fairytale Studios	iOS
Sago Mini Fairy Tales	Sago Sago	iOS
SHERLOCK: Interactive Adventure	HAAB Entertainment	iOS
Sir Charlie Stinky Socks and the Really Big Adventure	Egmont UK	iOS
Slice of Bread Goes to the Beach	Jelly Biscuits	iOS
Snow White	Nosy Crow	iOS

SOS Dinos in Distress	Audois & Alleuil Editions	Amazon/Android/ iOS
Terre inconnue	La Souris Qui Raconte	Android
The Artifacts	Slap Happy Larry	iOS
The Big Word Factory	Mixtvision Digital GmbH	iOS
The Cat in the Hat	Oceanhouse Media	Android/iOS
The Fantastic Flying Books of Mr Morris Lessmore	Moonbot Studios	iOS
The Friendly Ogre ('To read' collection)	La Soursi Qui Raconte	iOS
The Garden	Rocket Chair Media	iOS
The Great Ghost Chase	Audois & Alleuil Editions	Amazon/Android/ iOS
The Heart and the Bottle for iPad	HarperCollins Publishers Ltd	iOS
The Hope We Seek	Too Far Media	iOS
The Icky Mr Fox	ICKYPEN	Android/iOS
The Illusion Maker ('To play' collection)	La souris qui raconte	iOS
The King's Ear	Rascal Media	iOS
The Monster at the End of This Book	Sesame Street	iOS
The Numberlys	Moonbot Studios	iOS
The Nutons' Kitchen or How to Nurture a Gnome	Des Carabistouilles	iOS
The Ogress ('To play' collection)	La souris qui raconte	iOS
The Poppin Princess	Audois & Alleuil Editions	Amazon/Android/ iOS
The Three Little Pigs	Nosy Crow	iOS
Toontastic 3D	Google	Android/iOS
Toute la vérité sur le père Noël	La Souris Qui Raconte	Android
Troubles	La Souris Qui Raconte	Android
Two Left Feet	Resin Pty Ltd	iOS
Un autre monde	La Souris Qui Raconte	Android
Un rêve de sardine	La Souris Qui Raconte	Android
Une botte pour deux	La Souris Qui Raconte	Android
Une drôle de voisine	La Souris Qui Raconte	Android
Une île juste parfaite	La Souris Qui Raconte	Android
Victor's Cold	SlimCricket	iOS
Wild about Books	Random House LLC	iOS
Will & Kate	Ink Robin	iOS
Windy's Lost Kite	Loud Crow Interactive Inc.	Android/iOS
With a Few Bricks	Clea Diedonne	iOS
Wuwu & Co. – A magical picture book	Step in Books	iOS

Appendix B: The Questions Consulted with the Publishers

For Clair Gaudriot, A & A, France

Sent on 16 December 2015

La création de l'histoire :

1. Comment décidez-vous quel format (album, app, etc.) utiliser pour une histoire ?

2. Qu'est ce qui fait une bonne "story-app" [application], selon vous ?

3. Quelles sont les difficultés lors de la création d'une "story-app" ?

4. Comment définissez-vous l'action d'utiliser votre application : lire, jouer etc. ? Pourquoi ?

5. Pensez-vous que vos applications sont des "game-apps" ou des "story-apps" ? Pourquoi ? Selon-vous quelles sont les différences entre ces catégories.

6. Pensez-vous qu'ils soient nécessaire que les enfants découvrent l'ensemble de l'histoire ou du design durant leur lecture ? Pourquoi ?

Processus de design :

1. Quelle est la durée moyenne du processus de création d'une "story-app" ? Quelle partie du processus est la plus longue ?

2. Quelle sont les fonctions des "hot-spots" dans la narration ?

3. Que pensez-vous des critiques suggérant que certains "hot-spots" interrompent la trame principale de la narration, ou la concentration de l'enfant sur celle-ci ?

4. Selon-vous qu'est-ce que vos applications apportent aux enfants ?

Test :

1. Que cherchez vous durant la phase de test ? Quels feedbacks attendez-vous de la part des enfants ?

2. Quels sont les feedbacks que vous avez obtenus durant le test d'une application **et** d'un album ? Quelles sont les différences ou similitudes ?

3. D'après vous, lequel de ce format génère le plus de réponses et de discussions parmis les enfants ? Pour quelle raison, selon vous ?

Finance & Marketing :

1. Pensez-vous que la valeur narrative et artistique d'une application est liée à aux fonds/la somme d'argent disponible ? De quelle façon, selon vous ? Un exemple ?

2. Quelle partie du processus créatif coûte le plus selon vous ?

3. Quel est le marché idéal pour vos applications ? Quel est le consommateur idéal ?

Votre opinion:

1. Quel est selon vous le futur de l'édition numérique, en particulier celui des "story-apps" ? Pensez-vous qu'elles ont un avenir et pourquoi ? Comment pensez-vous qu'elles évolueront dans l'avenir ?

2. Est-ce que votre vision des "story-apps" a évolué depuis votre première publication ? De quelle façon ?

3. Pensez-vous que l'édition numérique présente plus de défis que l'édition papier ? Pourquoi ?

4. Que voudriez-vous dire à un chercheur étudiant la nature, le fonctionnement et la relation avec les enfants des "story-apps" ?

Merci d'avoir pris le temps de répondre à ces questions.

For David Miller, Kuato Studios, the UK

Sent on 19 February 2016

1. Are you familiar with ‘story(book) app’ or ‘interactive book app’ for children, such as story apps developed by Nosy Crow in UK? Are those apps books in your opinion? Why/Why not?

2. On *Between the Lines*, Mark Horneff said, and you agreed with him, that story was very important to Kuato Studios in developing games. What do you mean by ‘story’? Is the story a particular part in your games, or is it something throughout the games? If story is important, why did Kuato decide to develop games instead of story apps? What are the differences between your games and story apps? What are the differences between the two particularly in terms of storytelling?

3. What do you expect your games to offer children?

4. What are the (essential) differences between your games and games from other developers?

5. What makes a good game (app) for children in your opinion?

For Cynthia Nugent, Rascal Media, Canada

Send on 14 April 2017

1. Are story apps books in your opinion? Why or why not? Is there any relationship between them at all?

2. How do you position yourself in the undercurrent debate between book people and app people? Why?

3. How do you decide which format (picturebook, app, etc.) to use for a story?

4. What makes a good story app in your opinion?

5. There are ludic features in *The King’s Ears*. In fact, many story apps contain ludic features. What is your opinion about such features? What is the role of such features in a story app? How do you balance between game and story?

6. What’s your ideal reader like?

7. How long does it take, roughly, for creating a story app? Which stage of the producing process takes the longest?

8. What are the functions of 'interactive features' or 'physically engaging features' supposed to be in storytelling?

9. Do you think interactive features of a story app interrupts the story delivery for the child reader? Why or why not?

10. What do you expect your app and future apps to offer to children?

11. What do you look for during the testing of your app, if you tested it with anyone?

12. Do you think there is any difference between children reading a picturebook and playing with a story app? If so, what do you think are the reasons for that?

13. Do you think there is any relationship between the narrative & aesthetic quality of a story app and the sum of funds one can get to develop an app? If so, in what way? If not, why not? Any example?

14. Which aspects of the creative process of a story app usually cost the most? Is there any way to reduce the cost?

15. What would be an ideal market for you as an artist, and for your apps?

16. What do you think about the future of digital publishing, especially story apps? Do you think there is a future for story apps? If so, what do you think they may look like in the future?

17. What would you like to say to researchers who study story apps?

Appendix C: A Copy of Approval Letter for Ethics Application

University of Glasgow
College of Social Sciences

Application Approved

Ethics Committee for Non-Clinical Research Involving Human Subjects

Staff Research Ethics Application ☐ Postgraduate Student Research Ethics Application ☒

Application Details

Application Number:	400150030
Applicant's Name:	**Yan Zheng**
Project Title:	**Narrative Strategies of Story Apps for Children**
Application Status:	Approved
Start Date of Approval:	11/11/2015
End Date of Approval of Research Project:	30/09/2016

Please retain this notification for future reference. If you have any enquiries please email socsci-ethics@glasgow.ac.uk.

University of Glasgow
College of Social Sciences
Florentine House, 53 Hillhead Street. Glasgow G12 8QF
The University of Glasgow, charity number SC004401

E-mail: socsci-ethics@glasgow.ac.uk

Appendix D: Signed Consent Form from the Publishers

Clair Gaudriot, A & A

College of Social Sciences Research Ethics Committee

University of Glasgow

College of Social Sciences

Consent Form

Title of Project: Narrative Strategies of Story Apps for Children

Name of Researcher: Yan Zheng

1. I confirm that I have read and understand the Participant Information Sheet for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I consent to the questionnaires conducted via email.
4. I acknowledge that copies of transcripts will be returned to me for verification.
5. I consent to being named in any publications arising from the research.
6. I agree / ~~do not agree (delete as applicable)~~ to take part in the above study.

Name of Participant	Date	Signature
Claire Gaudriot	03/01/16	

AUDOIS & ALLEUIL EDITIONS
25 rue du 19 mars 1962 - 87100 LIMOGES
www.audoisetalleuil.com

Researcher	Date	Signature
Yan Zheng	16/12/2015	

David Miller, Kuato Studios

College of Social Sciences Research Ethics Committee

University of Glasgow

College of Social Sciences

Consent Form

Title of Project: Narrative Strategies of Story Apps for Children

Name of Researcher: Yan Zheng

1. I confirm that I have read and understand the Participant Information Sheet for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I consent to the questionnaires conducted via email.
4. I acknowledge that copies of transcripts will be returned to me for verification.
5. I consent to being named in any publications arising from the research.
6. I agree / [redacted] to take part in the above study.

DAVID MILLER — Name of Participant

15 MAY '16 — Date

David Miller — Signature

Researcher: Yan Zheng

Date: 19 February 2016 Signature:

Cynthia Nugent, Rascal Media

College of Social Sciences Research Ethics Committee

University of Glasgow

College of Social Sciences

Consent Form

Title of Project: Narrative Strategies of Story Apps for Children

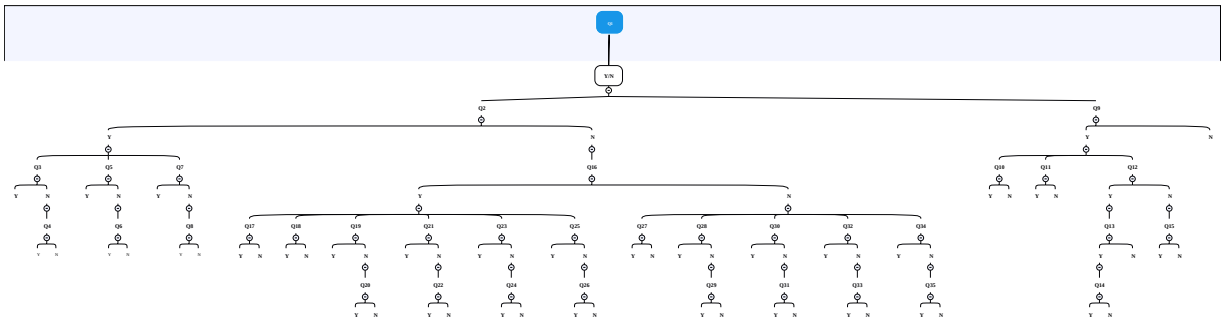
Name of Researcher: Yan Zheng

1. I confirm that I have read and understand the Participant Information Sheet for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I consent to the questionnaires conducted via email.
4. I acknowledge that copies of transcripts will be returned to me for verification.
5. I consent to being named in any publications arising from the research.
6. I agree / [redacted] to take part in the above study.

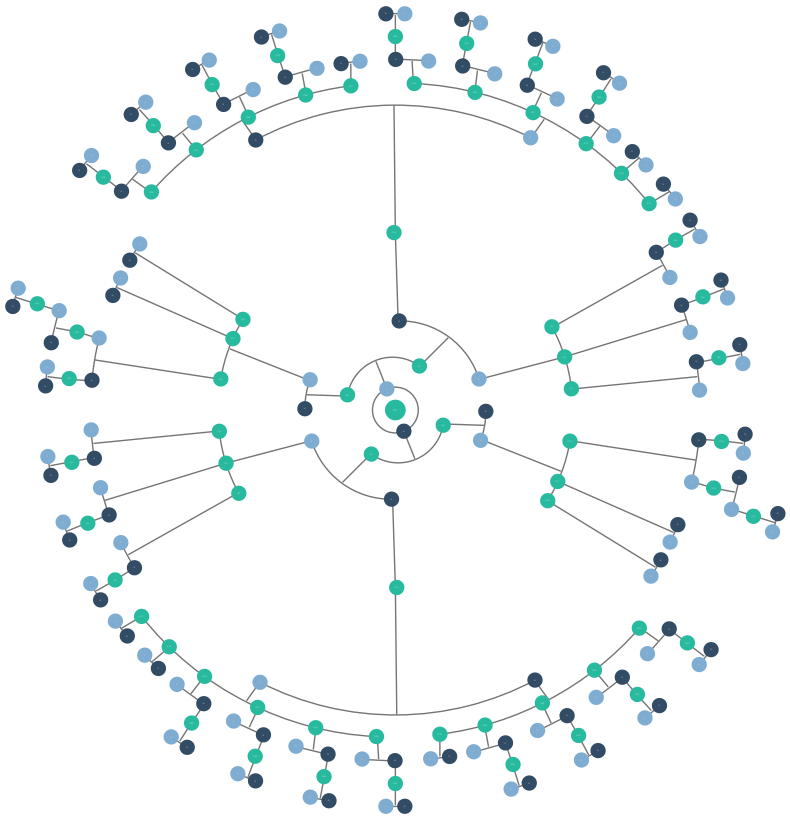
Cynthia Nugent	May 15, 2017	C Nugent
Name of Participant	Date	Signature

Researcher: Yan Zheng	Date: 14 April 2017	Signature:

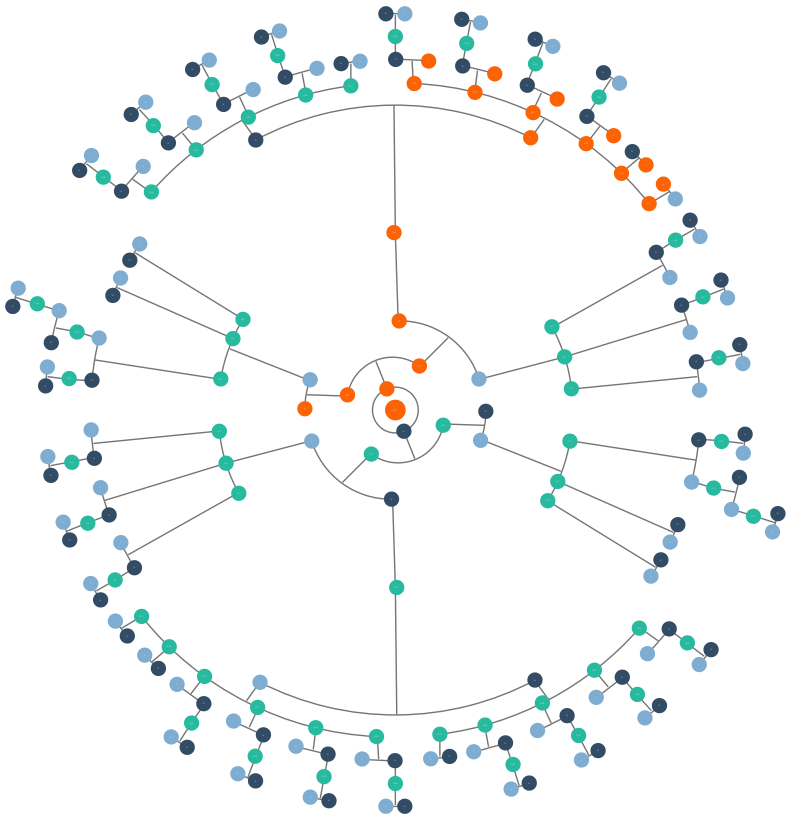
Appendix E: Zoomable Image of Figure 3-6



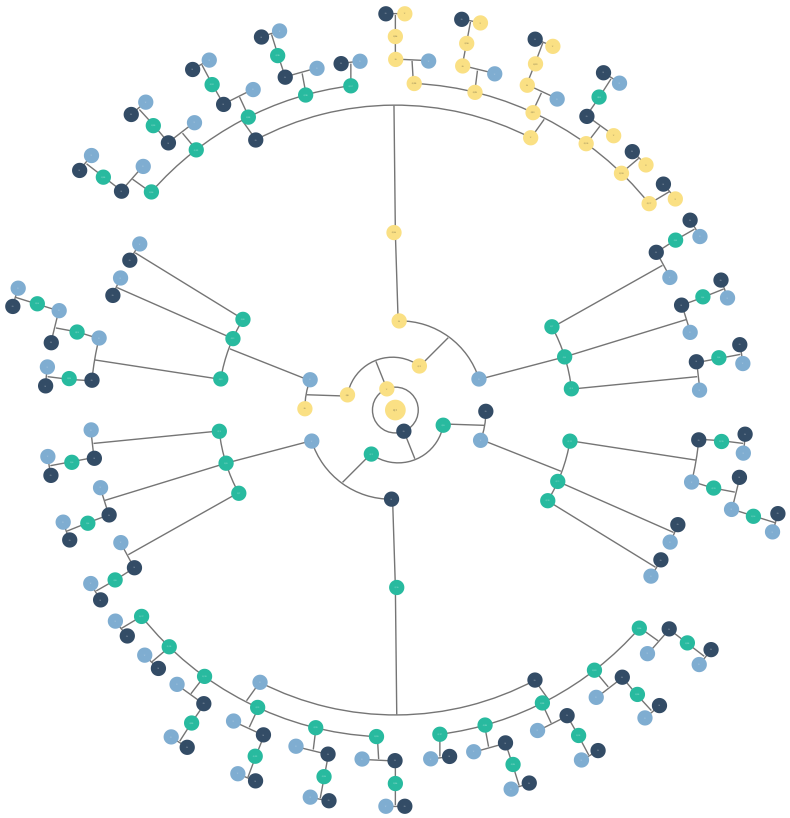
Appendix F: Zoomable Image of Figure 3-7



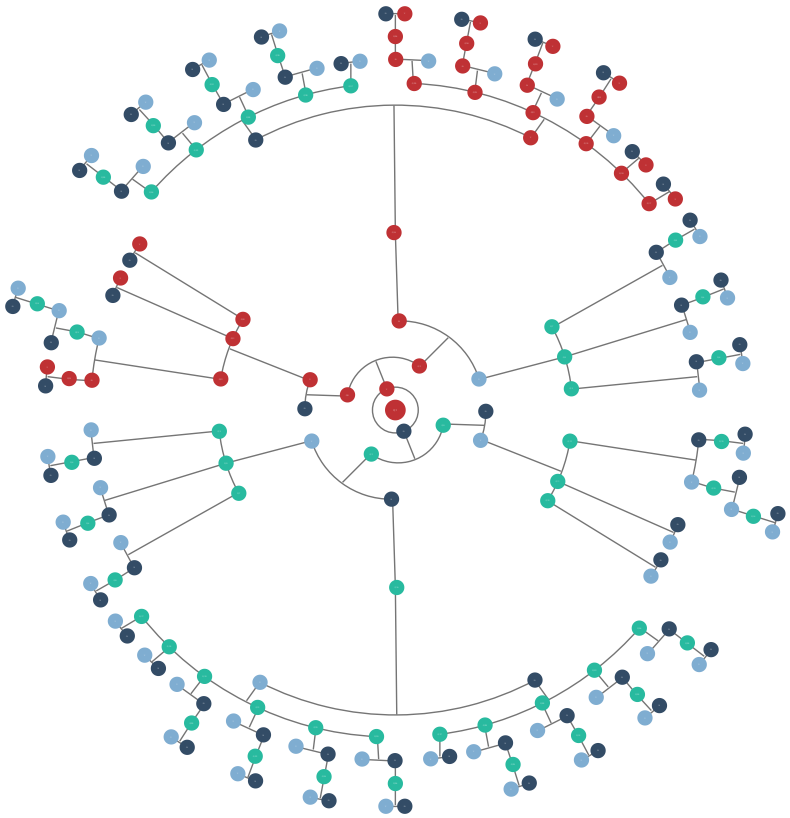
Appendix G: Zoomable Image of Figure 3-9



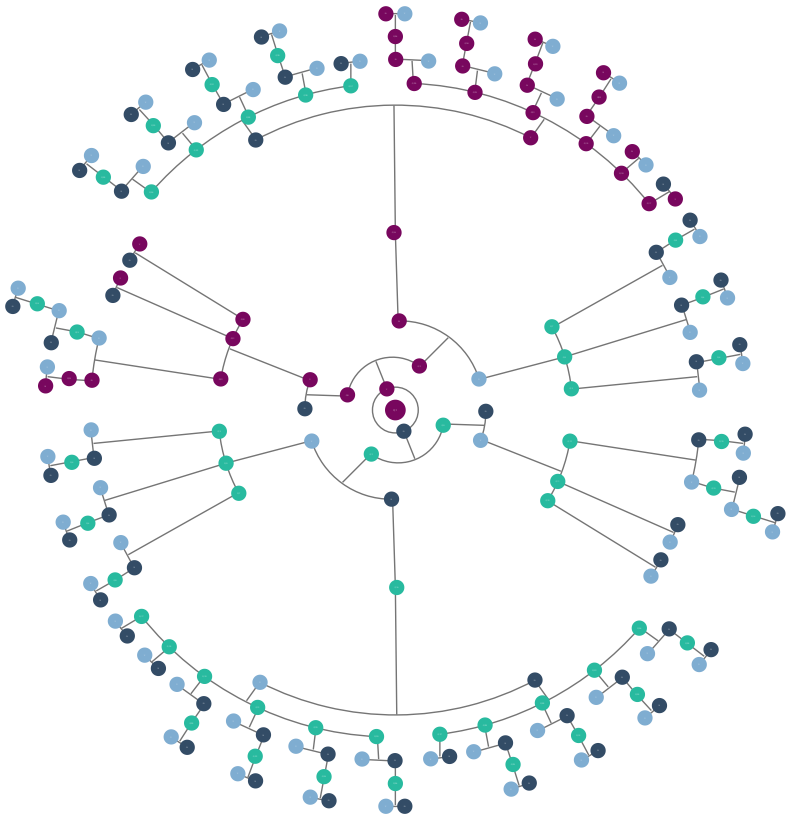
Appendix H: Zoomable Image of Figure 3-10



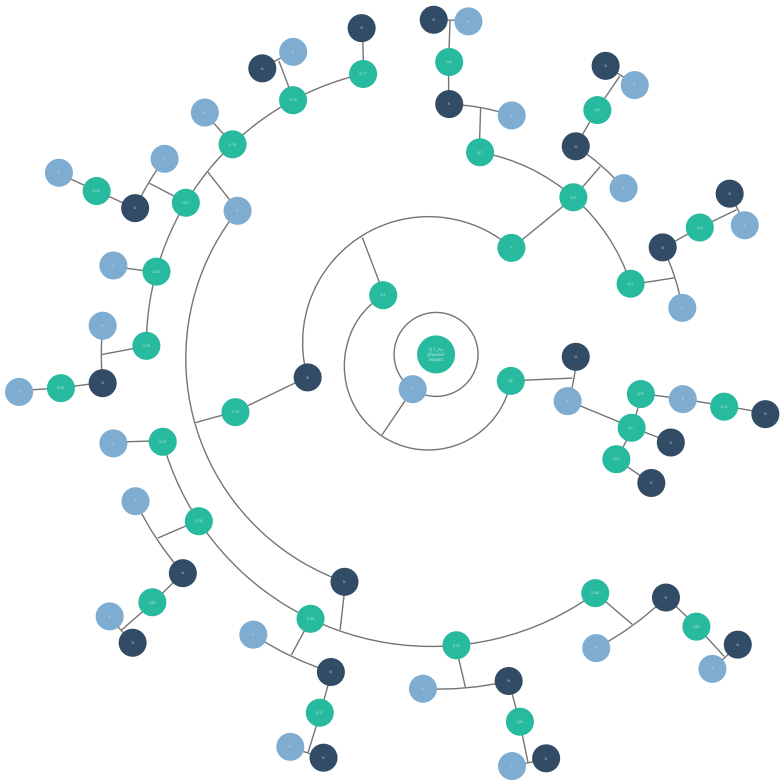
Appendix I: Zoomable Image of Figure 3-12



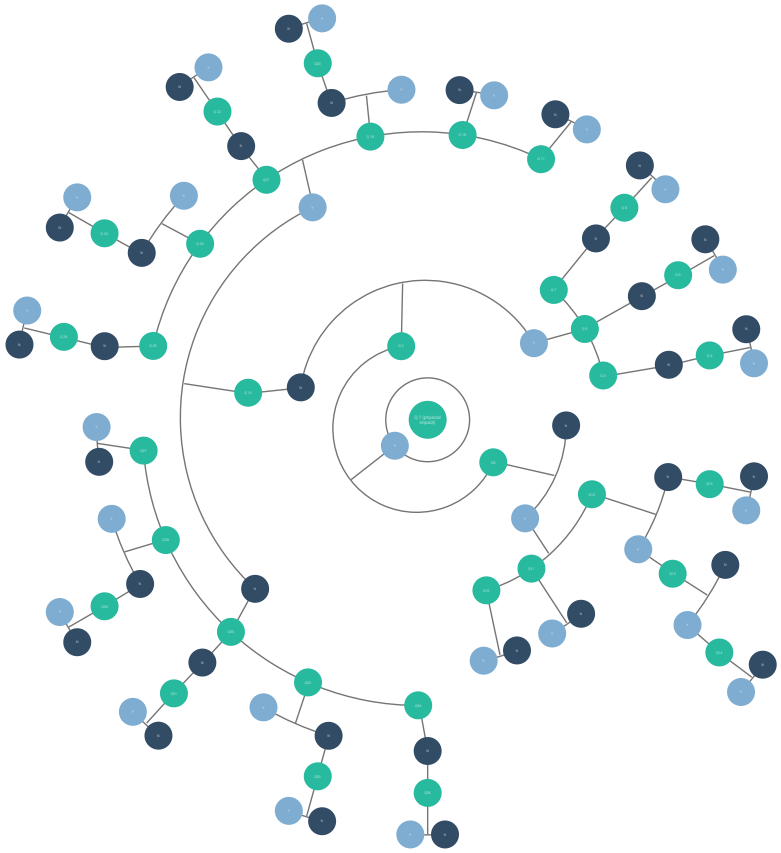
Appendix J: Zoomable Image of Figure 3-14



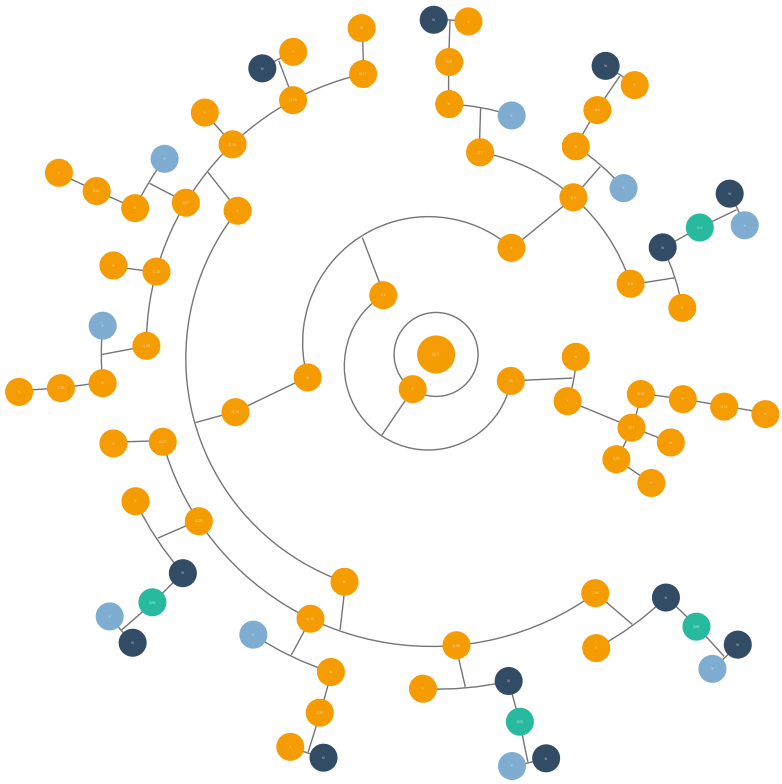
Appendix K: Zoomable Image of Figure 4-7



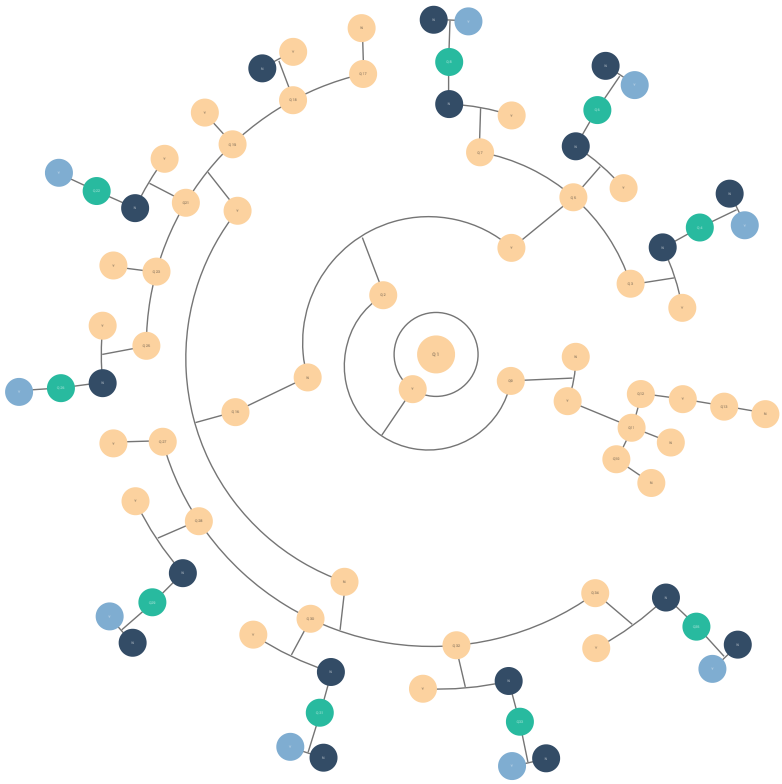
Appendix L: Zoomable Image of Figure 4-8



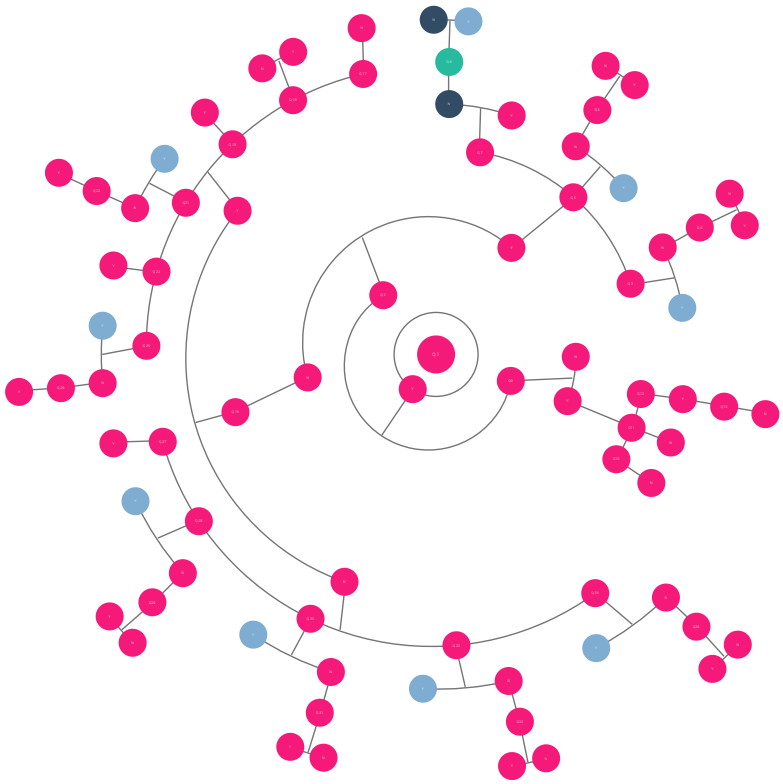
Appendix M: Zoomable Image of Figure 4-9



Appendix N: Zoomable Image of Figure 4-10



Appendix O: Zoomable Image of Figure 4-16



Appendix P: Zoomable Image of Figure 4-17