Wicked Problems in Interface Design: Reflections on the Theories and Practices of Remediation

Subrata Dey

School of Humanities- Department of Media

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Subrata Dey   December 2018

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Here in Australia, there are some individuals without whose contribution I would not have survived the loneliness and helplessness that often overtakes you in a foreign country. You look for a hand that can give you some assurance when you are in dire

ABSTRACT

Wicked Problems in Interface Design: Reflections on the Theories and Practices of Remediation

This project sets out to investigate the ways in which media technology designers might be helped through employing frameworks of understanding from the field of media studies. The overarching goal of this study is to probe the contributory matrix of factors that play a role in the development of a technology interface and its usage. This goal is worked upon by tracing the diverse factors that come into play while remediating a pre-existing medium like oral storytelling onto a digital media interface. Drawing from relevant media theories on determinism and remediation, the transactional linkage between media technology evolution and socio-cultural conventions is established through the juxtaposition of technological determinism and social-constructivism. This linkage is thereafter used to question the conventional paradigm in design practices where the underlying role of pre-existing media technologies and media cultures in the shaping of a new media interface and its usage is overlooked. This assertion about design practices is then explored through an interface development initiative where oral storytelling practices that employed orality as the dominant medium were remediated into a digital interface through developing a virtual 3D avatar who tells a story to the user. Both eye-tracking technology and questionnaires were used as measurement tools to gauge the users' response to the interface. Exposing the underlying complexity inherent in the process of remediation was guided by the paradigm of 'wicked problems' in design thinking. The methodological stance for this study also drew inspiration from the idea of social-constructivism which suggests chronicling the underlying socio-cultural factors that affect the development and use of a new media technology. The features of orality, literacy and virtuality media cultures as laid out by medium theorists were understood as cultural variables whose underlying effects on the development and the reception of the new media interface were explored. The findings of the study indicate that the conventional assumptions about 'immersion' and 'distraction' in a real-life oral storytelling performance are inadequate to explain the user responses when the oral storyteller is remediated into a digital interface.

The wickedness in remediation design problems is compounded by the fact that user reception of a given media technology and the content that is conveyed through it may vary with time. The reception of a media technology interface is shaped indirectly by the emerging conventions of the virtual culture and also by the pre-existing cultures. Media technology designers need to use a broader matrix of analysis where their assumptions and results are positioned within a continuum of media evolution that has multiple socio-technical dimensions as contributory factors.

CHAPTER ONE

Introduction

This interdisciplinary doctoral research lies at the cusp of human computer interface design and media studies as seen through the lens of theories and concepts related to each. The underlying issues that stimulate the research are: How does the power of technology design become a determining factor in shaping peoples' consumption of media? And, how is the development and use of a media technology interface itself shaped by factors related to cultural practice, the evolutionary stage of media consciousness and socio-economic practicalities? While these fundamental issues have been researched in the academic arena in myriad ways, I realized the relevance of this question in my own personal profession while heading the user interface design team of an organization that delivered educational applications for mobile devices.

The Motivation

Designing interfaces for educational applications for mobiles, I realized that the creation of a particular application design was generally perceived as a product of the mobile technology, available software programming languages and the creative impulse of the interface designer/s drawing certain inputs from the consumer research. Therefore the success or failure of a particular application design was also ascribed to the very same factors. Very rarely was there an effort or a scope to look at the historicity of the broader cultural or socio-economic forces that have resulted in the evolution and adoption of mobile technology as a media and its use in the context of other pre-existing media cultures. The fact that education through mobiles (termed as mobile learning) exists within a continuum of rivalling or co-existing educational conventions built on the pre-existing cultures of oral, print and electronic literacy was largely overlooked. Functioning within the goals of revenue-driven corporate bodies, interface designers often try to use a popular and powerful technology to box-fit their own design prowess. They thereby consciously or unconsciously bypass the reality that any given technology at a given point of time may have pre-existing socio-cultural residues inherent in its conception as well in its

consumption. An application design thus often defies the designer's intentions and is used by people in ways that are unique and unexpected.

One of the best examples of this phenomenon was revealed during the survey carried out by me on behalf of Enable Mobile Technologies (my employer) for a research paper that was later presented in Mobile Learning Conference 2009. A girl in a remote Indian village who subscribed to *Nokia Life Tools English learning* via SMS used to copy the SMS content into a notebook for adding further details on the same topic and using it for collaborative learning amongst other village kids without mobiles. The fact that electricity availability in the village was only for a few hours a day limiting the mobile's battery recharge opportunities also prodded this practice to a certain extent. However, the dominant reason was to use the mobile to acquire learning content and thereafter expand the scope of learning by using the traditional method of writing on paper. This was however not the intended manner for using the technology where it was assumed that the users would be learning the English lessons solely through the mobile interface. Taking a cue from this observation, Enable Mobile Technology (my organization) developed a printed pocket book with relevant codes and English content that would function in tandem with the SMS content to deliver the intended learning experience. This was an intuitive reaction of the design team aimed at boosting the acceptability of the mobile learning application and the sales figures.

However, reflecting on the incident, I realized that there was an inadequacy in the design thinking process which, driven by the zeal to establish the new media practice of mobile learning, overlooked its transactional linkage with the pre-existing cultural practice of learning through writing on paper and printed books. At a generic level, this incident also revealed the gap in conventional technology design processes where the framework for analyzing the success or failure of a given design does not venture out to account adequately for the subliminal variables in the cultural practices that are not visible within a small frame of time and space. The field of media studies, through a body of relevant theories and studies, provides explanatory tools that can illuminate the ways in which emergent media practices evolve not only through the affordances of a given new media technology but also

through the technology's interaction with the pre-existing social, economic or cultural forces. This study is therefore motivated by the scope for the media technology designers to gain from the broader analytical frameworks that are employed by the field of media studies to understand these underlying issues of media evolution and reception.

The Premise

Drawing inspiration from this introspection on my professional experience as a designer of technology interfaces, this project sets out to investigate the ways in which technology interfaces shape up in a particular manner and are then used in ways that may match or defy the assumptions of the interface designer. This continuous transaction between the media technology developers and the users has been theorized to operate within the domain of 'remediation' that has been a consistent phenomenon for media technology evolution. 'Remediation' as posited by Bolter & Grusin (1999) is the phenomenon of new media technologies being developed by appropriating certain facets of pre-existing media technologies and cultural conventions existing around them. For example, print technology appropriated to a large extent the technology of handwritten manuscripts and thereafter e-books used the 'book metaphor' to remediate printed books to their digital version. Similarly older technologies also may adopt new media technology practices to survive in an evolved form. However, this process of remediation through which new media interfaces develop and thereafter become a part of the people's living practices is not a linear simplistic process and explanations about the same vary in terms of the deterministic forces behind it. While the medium theorists like Marshall McLuhan and Walter Ong see media technology as the deterministic factors in bringing about decisive change in the culture of the society, social constructivists see the socio-cultural forces as a prime factor behind the way new technologies evolve and are used by people. Borrowing from both, I would hypothetically argue that the process of remediation through which a new media emerges is a result of multiple factors that may involve the affordance of the media technology, the design choices of the interface designer within a set of constraints and the user's own framework of interpretations. Probing deeper, the user's framework of interpretations and the designer's choices may be influenced by

diverse factors like pre-existing cultural conventions, political or economic factors. However, in this study the focus will be primarily on the pre-existing cultural conventions as the influencing factor on the users and the designers.

The Method

The strength of the argument stated above will be explored in this project through a live interface development initiative where the oral storytelling practice that employed orality as the media form will be remediated into a digital interface through creating a virtual 3D avatar with storytelling abilities. While ample options for remediation are available given the multiplicity of technologies in the current context, the rationale behind choosing to remediate oral storytellers into a digital interface is driven by the scope that it offers for exploring the implications of remediating one of the earliest forms of media culture. Oral storytelling has been one of the most primitive forms of storytelling that sustained and advanced civilizations across continents and cultures until script cultures and then Gutenberg's printing press switched the preference from orality to consumption of stories through the reading of the printed text.

However, consumption of stories through the use of visual and aural abilities of human beings came back into prominence with the emergence of cinema and television. Oral narratives in particular have gained popularity in recent times in the remediated forms of audio books, radio stories, podcasts and digital storytelling. This is very much in congruity with theories of remediation and predictions made by medium theorists. In recent times, oral storytelling performances in their traditional form have also proved their effectiveness in small scale social interactions (Lwin 2010). The increasing popularity of audiobooks, podcasts and radio stories have brought into debate the possibility that spoken words have the potential to restore literature to its oral roots and 'bring back the intimacy of the storyteller' (Rubery 2011: 12). However, audio-books, podcasts or digital storytelling bring back orality in a limited form within the affordances of their respective mediums. Oral storytelling performances are typified by the presence of the oral storyteller who offers multimodal communication in the form of the storyteller's physical presence, eye-contact, gestures, props and sometimes even the sense of touch. The exciting

range of contemporary technologies in the digital and virtual era offer us the opportunity to explore further possibilities of remediating the traditional form of oral storytelling performances and creating an alternate form of storytelling.

But as stated earlier, in spite of the multiplicity of technology options in the contemporary era, creating an effective storytelling platform through remediation is not merely an exercise in using a given technology. One of the most pertinent examples to portray the complexity inherent in remediation is that of e-books, where there is a persistent resistance to the adoption of e-books (the remediated version of printed books) resulting in stagnating sales and debates around its design effectiveness. While I will avoid further supportive detailing on the example of e-books at this introductory stage, I use the example for positing the necessity of mapping the different factors that play a contributory role in the development of such new media interfaces and those may not necessarily be limited to the technology being used. This project through its live exercise in remediation therefore attempts to expose some of these crucial factors that are often lost in commercial product-driven design assignments.

Theoretical Framework

The intention of this dissertation being exploratory in nature, the dissertation will use theoretical frameworks and practical experiments to complement each other. The theoretical frameworks will borrow largely from relevant theories in the field of media studies such as theories on media determinism, medium theory, the theory of remediation and Hall's encoding-decoding model. These theories will be considered in relation to their intersection with the design principles that drive the development of the interface and thereafter in the analysis of the results that arise out of the interface trial. The theories on determinism such as technological determinism, voluntarism or social constructivism offer differing explanations of the causal factors behind technology and human beings impacting each other's evolution. These theories on determinism are relevant for this project in understanding the bigger picture of how and why media technologies shape up in a particular way and also how they are used by the people. The application of technological determinism in the field of media and communications by medium theorists such as Neil Postman

(1985), Walter Ong (1982) on orality and literacy, Elizabeth Eisenstein (1983) on printing press, Joshua Meyrowitz (1985) on printing media and Marshall McLuhan's (1964) work on media interfaces as the prime shaper of the message will be used extensively to understand the possible effects of media on socio-cultural conventions.

The theory of social-constructivism on the other end of the spectrum has inspired the methodological perspective of looking at the cultural conventions at a given point of time as definitive factors that influence both the media interface designers and the users to shape the path of a new media evolution. An off-shoot of the medium theory is the theory of 'remediation' where Bolter & Grusin (1999) offer a theory of remediation for the digital age by positing that new media are not essentially new and divorced from the older media, but acquire their cultural significance by positioning them against older media such as perspective painting, photography, cinema and television or refashioning them within the digital landscape. The theory of remediation has been used extensively in this dissertation as a self-reflective tool to analyze the choices made by the designer/s as well as by users of the interface.

Philosophy of Design

As the interface design in this study is one that is not stimulated by a definitive lifestyle problem or deficiency that needs a definitive solution, the philosophy of design has been guided by the approach of 'wicked problems' in design thinking as initiated by Horst Rittel (Kunz & Rittel, 1970, Rittel and Weber, 1973) and thereafter expanded on by John Buchanan (1992). The 'wicked problems' approach in design thinking is found to be appropriate in remediating oral storytelling as it is an approach to deal with design problems where the goals are ill-formulated, ramifications are yet to be ascertained and the potential users have divergent values and gratifications.

Research Questions

The specific research questions that arise out of the overarching research questions and are explored through the interface design initiative are as follows:

1. How do the emerging digital technologies co-opt the pre-existing cultures of orality and literacy and what constraints do we face in this evolving process of co-option?

2. How does the emerging media culture of 'virtuality' relate to the reception of new media technology interfaces?

3. What role does the materiality of a technology interface play in shaping the reception of the technology by users who in turn have pre-existing cultural frameworks for interpreting the materiality of media interfaces?

Thesis Outline

Chapter two presents the overarching research question and explores the relevant media theories for framing the research. The useful aspects of remediation theory and medium theory are explored, along with the critiques of their tendency toward technological determinism. Some social constructivist theories from media studies are then explored and the possibilities of taking the best aspects of medium and remediation theories alongside theories that do a better job of accounting for social and cultural contexts are considered. Using the deterministic theories and the theory of remediation in conjunction with each other, the argument is extended to establish the gaps in the conventional design thinking process. The argument in this chapter that puts forward the criticality of the relationship between technology and culture is also used for analyzing the data arising out of the user trials of the interface at a much later stage in the dissertation.

Chapter three unpacks the idea of 'technology' as a research variable and lays down the assumptions about its materiality and affordances. A comparison of the stances by different medium theorists about the origin of technology is used as a basis to spell out the basic concept of the interface in which an oral storyteller is remediated into a digital interface. Examples of similar remediation initiatives in contemporary times in the form of e-books, audio books or podcasting are used to explain the complexities inherent in a remediation design exercise. Relevant media theories like medium theory, theory of remediation, reader response theory, the theory of conceptual metaphors and academic debates on the e-book's design

feasibility have been drawn upon to address diverse perspectives on remediation in the arena of storytelling.

Chapter four explores the theories and methodologies most common in media design contexts. It specifically teases apart a variety of design approaches, finally considering design thinking and the theory of 'wicked design problems' as the most relevant approach for design problems in remediation. The concept of wicked problems in design addresses design problems that are indeterminate in nature, where goals have no defined formulation provided by a client and therefore have undefined criteria for evaluating the solution. Steps to be followed in the design process from that of 'exploration' to that of 'testing' and 'analysis' are laid out with their accompanying rationale presented for the use of qualitative and quantitative methodological tools of focus groups, surveys and observational techniques like eye-tracking .

Chapter five lays out the details of the 'exploration' stage in the design process through questionnaire survey and focus groups. Unlike focus groups in conventional design processes where definite product features are discussed, the purpose here is to tease out the cultural constructs of orality, literacy and virtuality that are inherent in our consumption of stories through media. The chapter therefore starts with a discussion on the cultural constructs and conventions of orality, literacy and virtuality as delineated by Ong (1982) and Dempsey (2014). These characteristic features of orality, literacy and virtuality cultures are thereafter mapped against the data from the focus groups transcripts to trace the different cultural conventions that may shape our media consumption and our responses towards different media interfaces. The data from the questionnaire survey is used to complement the focus group data and reveal the wickedness in the remediation design problems.

Chapter six is devoted to the detailing of the interface development, experimental design and measurement apparatus for gathering relevant data. In doing so, it canvasses the relevant literature of previous work where different forms of digital technologies have been used for developing oral storytelling platforms and draws from their findings. It considers the concepts of immersion and distraction as applicable to story consumption and the ways in which they have been used for

evaluating or comparing media consumption. The chapter thereafter details the interface development where a 3D avatar of an oral storyteller is developed using Unity software. The other aspects of the experimental design are also explained in which both an eye-tracking tool and scaled post-test questionnaire are used as measurement apparatus in the experiment to measure immersion and distraction. In keeping with the social constructivist methodology, a few anecdotes at different stages of the development process are included to depict the instances where subjective choices of the software developers and the designer (myself) influenced by cultural norms may have had an impact on the way the interface shapes up.

Chapter seven takes a conventional design based approach to analyzing the experiment results. It deals with the statistical analysis of the data arising out of the measures of eye-tracking and post-test immersion questionnaire. The method of data collection from the eye-tracking unit is explained before the tabulation of the results. The results from the statistical analysis of the data have been given first for the eye-tracking measure and then for the scaled post-test questionnaire. Both the measures separately have been used with the same objective of estimating relative levels of immersion and distraction for comparing the two groups of participants: the AVATAR group using the interface with the 3D virtual avatar as the storyteller and the NO-AVATAR group using the interface without the 3D avatar but everything else being the same. The discussion on the results in this chapter is strictly within the context of the hypotheses regarding the differences between the two groups in terms of immersion and distraction and also exposes the anomalies and contradictions within the results.

Chapter eight analyses the broad findings from the earlier chapter by applying a typical media studies approach with the relevant theoretical constructs. It maps the ways in which immersion can be aligned with Bolter and Grusin's concepts of immediacy and hypermediacy - establishing a conceptual bridge between the two disciplines through these overlapping frameworks. The analysis uses this linkage as a foundation to question the traditional design assumptions about the linkage between realism and immediacy and Masahiro Mori's (1970) concept of 'uncanny valley' phenomenon in the field of robotics is also drawn upon in this context.

Possible explanations for the anomalies and contradictions in the results of the experiment are attempted by applying the ideas of 'hypermediacy', Hall's theory of encoding and decoding and the concept of 'presence'. The unique characteristics of the audience in the virtual culture as opposed to those of oral and literate cultures as discussed in chapter four is brought back to the fore along with focus group data to reveal the complexities of remediating a real-life oral storyteller through a virtual 3D avatar in a screen-based interface. In totality, the discussion in this penultimate chapter exposes the wickedness of the design problem in this given attempt at remediation.

Chapter nine is the concluding chapter of the dissertation that summarizes the findings in light of the research questions, lists the limitations of the study and the scope for future research.

Contribution

This research makes primary contribution by exploring the wickedness in designing media technologies that involve remediation. It establishes the ways in which remediation design problems can be classified as 'wicked design problems' and thereafter buttresses the argument through an interface building exercise that involves remediation. At a broader level, it serves the purpose of bridging the gap between the disciplines of design and media studies where the success, failures, anomalies and contradictions in a given interface design initiative can be understood by applying the theoretical constructs modelled on a broader network of contributory factors.

CHAPTER TWO

What's it all about: The Theoretical Foundation

In the film I,Robot, when the humanoid Robot chooses to save Detective Spooner's life and lets a girl die in spite of Detective Spooner's order to save the girl, Detective Spooner questions the Robot's effectiveness and intentions. However, Dr.Susan explains that the robot was not designed to function based on human emotions as that may not maximize its first guiding law to save human beings. A robot as per the designer's code will try to save the one who has the maximum probability of being saved and not be guided by 'subjective' factors that may go against such a choice. Though Detective Spooner hates the robot for the choice made by the robot and considers it to be responsible for the death of the girl, the rationale for the decision did not in any way belong to the robot. It was a choice that was guided by the rationale of the code that was built into its code of conduct by the designer of the robots. If these codes lacked the nuances of human judgment which prides itself for its so called 'subjectivity', the accountability for the robot's unacceptable decision tree obviously lies with the underlying assumptions of the human designer/s who created it. Being a thriller sci-fi meant for the mass entertainment, Detective Spooner for obvious reasons focusses more on the impact of a technology gone wrong and looks for heroic solutions. But if Detective Spooner was to don the mantle of a rigorous academic researcher instead of having to take the story forward, it would have made him wonder in the backward direction: What made the designer or the group of designers think in the way that they did? The simple question becomes hydra-headed when we ask further: What made them ignore the complexities and subtleties of human emotions and subjectivity of a given situation? Was the designer critical of human emotions and did they see everything in terms of statistical figures? Or was it an unconscious act of simplistic design constrained to a certain extent by the constraints of the robotic technology? What are the untold stories of the daily decision-tree and contingencies that are never considered essential for the technology chronicles?

The film I,Robot like many other sci-fi thrillers simplifies the technology-society interaction into the consequences of a technology gone berserk, albeit from the human point of view. The creator is treated as the 'gifted Genius' whose quirks foist this technology from the black box of technology onto the human society and then the technology mutates itself into a Frankenstein. This is what has kept the media and public discourse abuzz with topics ranging from the impact of video games to television and mobile phones and every other technology that we can think of. Technology is treated as the black box of magic from which emerges the genie that revolutionizes the human civilization. 'They do new things. They give us new powers. They create new consequences for us as human beings. They bend minds. They transform institutions. They liberate. They oppress' (Silverstone 1999: 10). However, those like me who have been associated directly with technology interface design and many others in the world of technology research would agree intuitively that the real world of technology is certainly not about the lone geek crusader whose creative spark suddenly sets the cat amongst the pigeons. This is more true for digital technology interfaces or applications like Facebook or YouTube that are said to have sweeping impact on the masses across the world. Such interfaces shape up through a complex network of collaborative efforts even when urban legends are fashioned to credit the creation to a singular character or characters. Social, cultural or historical forces that use the pre-existing technologies as a foundation to build a new technology are mostly ignored in order to create a cult around the creative genius. Silverstone (1999) voices the same concern when the desire for change or fear of the change distorts rational analysis and we are seduced by the simplicity and the immediate implications of the change.

Would it be therefore relevant and rewarding for me to undertake a project that tries to design a media technology interface and through the process of development unpack the contributory matrix of technology, designers, society, culture and individuals that shape the interface and also the users that react to the prototype? This intuitive notion finds a certain degree of resonance in the words of social constructivists like Donald MacKenzie and Judy Wajcman (1985: 2) who believe that the priority is to ask 'what has shaped the technology that is having "effects"? What has caused and is causing the technological change whose 'impact' we are

experiencing?' While these questions raised by the school of social constructivists, surely echo the same objectives as my research to tease out the contributory factors behind the creation of a new digital media interface, there have been different stances and methodologies for finding the answers to a similar set of questions. The questions of the social constructivists have also come to a large extent as a riposte to the opposing cause-effect school of thought where questions regarding technology and society have been interpreted with the assumption that technology is a 'black box' that is monolithic, self-generative and has a linear effect on the society very much in the way we observe in the film I,Robot. The realm of this fundamental debate is replete with variations to the questions that have been asked by the different schools of thought and also the differences regarding the causal factors. A comprehensive analysis of the relevant theories and stances would lay bare the theoretical perspectives that would inform and guide the different stages of the research.

Scope of the discussion

Before I use the initial idea laid out so far to launch into an advanced discussion, I will lay out the rationale for the structure of the discussion to be carried out in the remaining part of this chapter. I will start with the basic premise that this study aims to develop a media interface "X" and use the process of development and user trials as the test case for addressing the debate as initiated through the anecdote from the film I,Robot. I will fend off the tendency to provide details on what exactly X stands for and leave it for a later chapter. This is because the interface development in this research will serve as an observational tool and therefore will be worth defining only when the discussion around the appropriate theoretical perspectives and earlier research findings throw up a more sharply focused objective that the interface "X" will help me achieve.

The discussion hereafter will initiate around the overarching research question: Does the monolithic power of technology design become the determining factor in shaping people's consumption of media, or is the development and usage of a media technology interface itself shaped by factors related to cultural practice, the evolutionary stage of media consciousness and socio-economic practicalities? Discussing the theoretical schools of thought that have already attempted to answer

this question or similar category of questions will build the foundation for asking more specific research questions that develop as I progress through the discussion on this overarching question. The nature of the overarching question being deterministic in nature, it mandates a comparative analysis of the different theories of determinism at the very start. The objective is to reconcile the apparent contradiction in these theories in order to establish a linkage between the evolution of the media technologies and the ultimate users of the technology. This relationship between media technology evolution and the users of the technology who thrive within a socio-cultural matrix will thereafter be used to argue for an amendment in the conventional design thinking process that gives rise to new media interfaces. The theoretical reconciliation will therefore provide a methodological rationale for conceptualizing the interface development in this project and also teasing out the contributory factors acting behind the way the interface evolves and is used by the users.

It is also be worth acknowledging the fact that readers may discover a significant degree of reification as they face the usage of the term 'technology' in the discussion that follows in the rest of this chapter. Reifying 'technology' is essentially treating it as one block of undifferentiated object or entity. However, this self-imposed reification is justified in certain contexts for the purpose of argumentation as 'virtually any one of a wide range of technical innovations can stand symbolically for the whole of technology' (Benthall 1976: 22) because 'the symbolic field of technologies is interconnected'. The deconstruction of the reified term of 'technology' will be postponed until the next chapter.

Technology and Media Culture: Technological Determinism/Media Determinism

The aim of this research is to probe the matrix that shapes 'media technology interfaces' and thereafter also the extent to which it shapes their immediate consumption in the short-term and thus there is a cause-effect relationship that is inherent in the research questions. Social constructivists' model of determinism has posited social and cultural forces as the primary drivers in the development of technology. As discussed earlier, the fundamental questions addressed by social constructivists have a strong fit with the aims of my research. However, social

constructivism can only be assessed for its suitability to the research when it is seen in the context of other deterministic theories that it tries to critique and override.

The cause-effect relationships in media have been widely debated through deterministic theories of media in the same way as biological deterministic theories have tried to explain social or psychological phenomena in terms of biological or genetic characteristics. Social constructivists have been the most fervent critics of the theory of technological determinism (also referred to as 'media determinism'). Unlike social constructivists, technological determinism suggests technology to be the prime driving force behind human society and tries to explain the social and cultural variables of a society through the causative effect of technology. The term was in all probability coined by the American sociologist and economist Thorstein Veblen (1857-1929) and thereafter assumed importance in media mainly through the work of medium theorists who theorized the emergence of media epochs and cultures goaded by the adoption of certain dominating media technologies. While the school of thought espousing technological determinism focus their arguments around the issue of what technology does to the human society and consciousness, they skirt the question of who and what shapes the new form of technology. Though my research focus is centered on the latter area of discussion, I would briefly discuss the former area for two reasons: Firstly, it is the basic propositions of technological determinism that have invited the retaliating critiques in the form of social constructivism. Secondly, because the effect of technology on society and culture as posited by the determinists may have a role to play in answering the question of who and what shaped the new form of technology.

In the period prior to the 1980s, there was a significant section of media and technology scholars who saw technology as an autonomous shaper of human history and culture (Winner 1977). The central question in the study of technology and media has almost always been the question of agency and the extent to which we as humans have control over the technology that we use and our socio-cultural systems (Chandler 1995). Technological determinism is a theoretical stance that rests on the connections between the dominant communication technology of an era and the salient characteristics of the society in the particular era (Burnett and Marshall 2003: 9). Technological determinists in the most stringent form have

argued that media technologies specifically have been the prime determinants in shaping human society that include its institutions, culture and individual interactions. Human intentions and socio-cultural systems are seen as secondary to the role of technology. Isolated assertions from Karl Marx have been interpreted as technological deterministic when he says that "the windmill gives you society with the feudal lord: the steam-mill, society with the industrial capitalist" (1847: 103). Other non-Marxist academics like Lynn White Jr., Harold Innis and Marshall McLuhan have also lent their support to technological determinism when they state that 'such inventions as the horse collar quickly led to the development of the modern world' (McLuhan & Watson 1970: 121). McLuhan also held the belief like many other medium theorists that printing technology was the prime mover behind the development of the nation state or the culture of literacy (Walter Ong 1982). In his seminal work "Orality and Literacy" (1982), Ong argues that the use of new technologies like writing and printing resulted in the societal transition from an oral culture to a written culture and also brought about a fundamental change in the form of human consciousness. When medium theorists like McLuhan (1964/1967), Ong (1982 /2002) or Joshua Meyrowitz (1985) argue for the stance that the media forms like writing, printing press and television have been the determinants of social change and cultural norms, it gives us a variant of technological determinism in the form of 'media determinism'.

In the context of my research, 'media determinism' serves as a relevant theoretical basis to explain the 'links between the dominant communication technology of an age and the key features of society' (Burnett & Marshall 2003: 9). This linkage can potentially help to tease out the conceptual drivers behind the technology designers' choices and ideas, the human designers of new technologies being an intrinsic part of the society and culture around them. It may also help to explain to a certain extent the consumption behavior of the users who participate in the initial prototype testing. McLuhan's (1964: 7) statement that the 'medium is the message' intends to throw light on the manner in which the technology or the media alters the 'sense ratios and patterns of perceptions' of users and thereby pre-determines the content itself. McLuhan's aphorism can be interpreted as a stricter line of media determinism where the new media seems to be determined largely by the binding constraint of

the media technology itself and forces the interface designers to innovate in a particular direction. However, from another perspective, the aphorism is indicative of the phenomenon that every media technology in its unique way creates its own set of cultural conventions for the users and thereafter also has a reasonable impact on the content that is chosen to be communicated through the specific media. The latter perspective of McLuhan's aphorism will be useful for this study as it acknowledges these cultural conventions that every medium creates through its own unique form and therefore can be a useful framework for interpreting the way users with these inherent pre-existing cultural conventions react to a new media interface. This proposition is also somewhat akin to the softer approach of technological determinism or media determinism which acknowledges the fact that the power of technology does not exist in isolation but lies with respect to other social and cultural factors (Soderberg 2013). However, even the soft approach to technological determinism is more focused on the effect of technology on the society in the sense that technology is external to the society and culture.

The clash of the technological deterministic approach with the critiques is amply exemplified through the case of development of a mobile interface design by Nokia where children were involved in the design process. The children with few pre-conceptions about technology were asked about their expectations from the mobile phones and the interface design thus created with client participation was thereafter standardized by Nokia and sold as a mass market commodity. The mobile interface then served as a 'broader context of the global market design' (Veak 2000: 227). While media determinists would interpret this phenomenon as a case of determinism where a standardized interface design if successful will control and shape the daily lives of millions of users across the globe, the critiques will see the same phenomenon of interface design as being inherently political. Consequently the observed constraint on design choice is not some 'essence' of technology but can be explained by the hegemonic control of the design process by privileged actors (Veak 2000). While one can partially agree with the determinist view that a given interface design or media technology can influence the lives of millions across the world and bring about a definite shift in their living practices which constitute culture, the complete acceptance of the determinist position would lead us to a cul-de-sac as

there are no answers or references to the contributing factors that stimulated the emergence of the particular media interface. It would almost make us believe that technology is a juggernaut that is rolling on its own initiative and priorities. The question that can't be avoided is : If technology is designed by human beings (even robot designers create designs as per human logic) and also consumed by human beings living within the framework of socio-cultural norms and values, is it not natural that their choices about every technology alternative would be affected by the socio-cultural norms that they thrive in? The technology determinists would be a loss to explain the acceptance or rejection by users amongst a host of emerging media alternatives. It also does not explain the process by which a media form evolves and mutates and takes the shape that finally is considered to be a dominant form with its possible effects on socio-cultural norms. Medium theorists through their notion of media determinism assume the media innovation as a given and a constant and neglect the conditions that give rise to new media forms. This is very close to the concept of techno-evolutionism which provides linear fixed steps of technological stages that bring about the evolutionary social change (Chandler 1995). The developmental process of a technology from technology deterministic stance is also a standardized linear process that looks similar to the flow given below.

Product & Market Research-----Development----Pilot Plant------Scale Up----Production-------Product Development

This is also precisely the inherent assumption of technology companies where media or technology choices that they make are viewed as innovations that should be credited solely to their institution and the limited domain of the designers or decision makers responsible for the product. The institution and the designers of technology as an unstated assumption are treated as external to the society. Almost speaking and assuming the same tenets as technological determinists, the technology innovations are seen by the technology developing organizations as products that will impact the society in a linear unidirectional manner and therefore they often fail to understand the socio-cultural or even economic context in which a particular innovation is accepted or rejected or sometimes accepted with modifications.

As stated earlier, though media determinists offer a useful framework for this project through their impressive detailing of how technology impacts people's living practices and consumption of media, they do not offer an explanation of how a given media technology emerges from within the society at a particular historic moment and thereafter goes through an evolutionary stage before being accepted by a dominant majority of the population. It also does not account for the free will of individual human beings as an effective causal factor in the way media choices are created and consumed thereafter. It is precisely to fill this lack of explanatory power with respect to technology choices and development that the social constructivist model serves its purpose, albeit within its own limitation of assumptions.

Technology and Media Culture: Social Constructivism/ Socio-cultural Determinism

Social or cultural determinism as a theoretical perspective is borne of social constructivist approaches to technology and the most radical stance of the theory posits that technologies and techniques are solely determined by social and political factors. The inadequacies of the technological determinism are partly taken care of by the social or cultural determinism. This is a social theory and method geared to explaining how technologies arise and how they are shaped through various kinds of social interaction. The social constructivists try to show 'why it is that particular devices, designs, and social constituencies are the ones that prevail within the range of alternatives available at a given time' (Winner 1993: 368). The social constructivist stance has a better congruity with the research questions of my study as its mode of inquiry is to 'look carefully at the inner workings of real technologies' (Winner 1993: 364) and explore their developmental process and factors that influence them. While developing interfaces, designers typically look at the design output as a single monolithic product that, when distributed to the mass market, would either succeed or fail to extract a single monolithic effect on the consumers. This linear monolithic approach of the technology developing community of which I was a part as an interface designer is essentially a technology deterministic stance. The social constructivists differ from this technology deterministic approach by studying the "interpretive flexibility" of technical artifacts and their uses. Technology

users might be using the same interface in different ways and attach widely different meanings and purposes to the interface. The social constructivists also try to identify the relevant social groups involved directly or indirectly with the development process of a specific technological device or systems or process and tease out the diverse 'interpretations of what a particular technological entity in a process of development means and how people act in different ways to achieve their purposes within that process' (Winner 1993: 366). However, the social constructivist approach which in the technological context has been defined as social and cultural determinism have methodological differences in approach within their school of thought to dealing with technology development.

The strongest version of the social constructivist is also known as the SCOT (social construction of technology) approach and mostly reflected in the work of scholars like H. M. Collins and Steve Woolgar. The SCOT approach stresses the principle of symmetry of analysis which essentially means that the success and failure of any technology should be explained with the same rigor of arguments and rejects the generic tendency to attribute the success or failure of any technology to the actual features of the technology. Development of technology and its adoption is explained through reference to methods of interpretation, negotiation and closure of decisions by different actors and social groups (Brey 1997). There are milder approaches within the same school of thought which use 'social shaping' approaches (Mackenzie & Wajcman 1985, Mackenzie 1990). 'Social shaping' unlike the SCOT approach recognizes the difference between the social and the natural or that between the social and the technical (Brey 1997). They also accept the role of non-social factors in technological change and acknowledge the 'properties' and 'effects' of technology defined in relation to a social context. But unlike the technology determinists, the properties and effects of technology are assumed to have become part of the technology during the development process itself. The third approach as posited by Micel Callon and Bruno Latour advocates the 'actor network' theory where significant social actors along with social, natural and technical phenomena act towards the stabilization of a technology. In the actor network framework, both human beings and non-living technological entities are looked upon as actors. Both the social shaping and actor-network theory provide a suitable conceptual

framework for designing an empirical study on the development of a new media technology and the ways in which these social forces have shaped the technology. The application of the social constructivist approach has been used earlier for studying the development of Bakelite (Bijker 1987), missile guidance systems (MacKenzie 2012), electric vehicles, expert systems in computer science, networks of electrical power generation and distribution and several other technological developments. These studies have pointed to the fact that technological innovation is not a uni-linear progression as is made out to be by the technological determinists but is a more complex process where diverse social and cultural entities act on contingencies and choices rather than the forces of necessity. For example, for the social constructivist approach, in order to analyze the development of bicycle design it is important to account for the role played by the industrial development of Coventry, a visit to the Queen by the English "Father of the bicycle" and the early bicycle races (Bijker 1997).

While the 'conceptual rigor, its concern for specifics and its attempt to provide empirical models of technological change' (Winner 1993: 367) makes the social constructivists model of inquiry a compatible theory for explaining the developmental process of the interface that I attempt to build in the course of this project, there are glaring 'questions about technology' and 'human experiences' that it leaves out. These have been mostly brought out by Langdon Winner's (1993) seminal article called 'Upon opening the black box and finding it empty: Social Constructivism and the Philosophy of Technology'. One of the questions posed against the social constructivist school of thought is about the concept of 'relevant social actors' who are responsible for bringing changes in the arena of technology. 'Who says what are relevant social groups and social interests?' What about groups that have no voice but that nevertheless will be affected by the results of technological changes' (Winner 1993: 369). Similar methodological concerns can be raised about how voices of dissent (albeit by isolated individuals) about a technological choice are managed and acknowledged. What is said or done about crucial issues on technology development that were worth debating but were suppressed by willful maneuvering by the relevant social groups or were not loud enough to be heard? So even as social constructivists would like to believe that every technology choice is

socially modelled for a common good, more often than not most technology choices lead to the satisfaction of particular needs and at the same time takes away the satisfactions of other kinds. So, 'each technically embodied affirmation may also count as a betrayal, perhaps even self-betrayal' and the diverse reactions to technologies are reflected in diverse choices made by the potential users. There is no singularity in opinion about technologies and even in the case of a dominant technology there has always been a significant minority who have rejected the technology during its development or during its adoption by the majority. While social constructivists talk about the relevant social forces and groups, they do not acknowledge or adequately explain the factors of financial inequalities or political power structures within the society/and social groups and its corresponding effect on the choices that are made about the technology. So, the social construction of technology may actually be the result of choices of a few powerful social groups based on financial or political power and not of the vast majority who have to accept these choices as their inevitable fate.

A good example for that is the adoption of e-book readers as the medium for reading in place of the older medium of printed books. The angst of loss can be felt when users of e-books feel nostalgic about 'turning pages' or 'dog-earing pages' or 'spilling tea on page 45'. While e-books give the much needed flexibility to carry a thousand books in the small light device, they also take away the pleasure of gifting books and treasuring that as a piece of history. The technology designs of e-books try to add more and more functionalities with the belief that it can eclipse the printed books but avid print book lovers hold on to their preference for printed books even as they use e-books for certain definite gratifications. After the meteoric rise in usage in the initial years, the sales figures of e-books have stagnated at around 30 percent of total books read (detailed in later chapters) for the last five years and unlike what many technology forecasters had predicted, printed books have continued to enjoy their dominance even amongst the average digital generation. On the other hand the competing media option of audiobooks which at one point of time had a very limited acceptance amongst the normal readers has now started growing faster than e-books across diverse age groups and backgrounds. This is seen by many scholars as the revival of the culture of orality as the medium of

storytelling because of certain favorable social realities. The development path for e-book and audiobook technologies are good examples of the complexities of the digital era where there may not be a single dominant technology that almost replaces the previous technologies as easily as was done in earlier periods of writing or printing. It is also a striking contemporary example that shows the limitations of both the social constructivists and technology determinists. I would argue that unlike what social constructivists believe, social and cultural forces that shape media technology are not limited to specific social groups who play dominant roles in the decisions about technology development or their usage. The social actors or groups who create the new technology interfaces and subsequently use them are immersed within pre-existing media cultures whose undercurrents and features affect the actions and decisions of the social actors or non-actors at a given point of time. Winner (1993) voices the same concerns and possibilities when he posits that social constructivism disregards the fact that the mechanism of any technological change cannot be understood in its entirety by merely   studying the characteristics and actions of relevant social groups but there are deeper cultural, intellectual or social factors that influence the origins of social choices about technology and its autonomous properties. In this dissertation I suggest that understanding the cultural, intellectual or social origins of the choices made about technology as mentioned by Winner can be probably enhanced by using the frameworks of orality, literacy and virtuality which are media cultures posited by the medium theorists. Though medium theorists see these cultures as an outcome of a technology revolution, the social constructivist perspective would prompt us to look at how the social actors or groups living and working within these media cultures are influenced by those very cultures in giving shape to new technology interfaces. This will be dealt with in further details in the latter part of this chapter.

The other most relevant criticism of social constructivism is about its methodology which Winner believes needs to be supplemented with macro-level analysis or analyses that involves reference to non-social factors. The micro level analysis does provide the much needed detailing of the evolution of a technology design process through its detailing of the characteristics and actions of relevant social groups but 'need[s] to be placed in a broader, macro-level context in which technical content

and the characteristics and actions of social groups are related to the wider social, political and cultural milieu in which they are found (Pinch & Bijker 1987: 46). This lack of macro perspective is reflected in the social constructivist studies having an apathy towards the social consequences of technical choices and how these social consequences in a wider frame of time and space can influence those very same social groups/actors who take significant decisions about technology development or its usage.

Reconciling technological determinism and social-constructivism

These inadequacies in deterministic stances have given rise to a realization that while accepting the deterministic role of any one factor like technology or socio-cultural forces is an unworthy proposition, it would also be 'a kind of madness' if we are simply determined not to be deterministic (Williams 1981a: 101, 102). Even within the strongest critics of technological determinism, there is a grudging acceptance of the fact that when certain technologies like writing or printing are stabilized they do exert impact on the living practices and thereby bring about certain significant shifts in the social and cultural values over a long period of time (Finnegan 1975). The parameter of the time frame in consideration is also one of the fundamental differences between the social constructivists and technology deterministic methodologies where 'technologically deterministic scholarship tends to look at larger scales of time and space than scholarship that is more constructivist' (Misa 1988: 309). The deterministic effects of technology, if any, are visible over longer time periods: 'five decades of increasing intensity of transistors' or three decades of penetration of mobile phones. As Misa (1998:320) likes to put it : 'from a shop floor perspective technological determinism is an irrelevant abstraction, and what makes history is individuals' and 'a row of machines is not itself a compelling historical agent'.

One of the ways this has been dealt with by researchers who carry out both micro and macro studies is by assuming the 'epistemological superiority of micro-studies' and 'rejecting the findings from macro-studies using the evidence from micro studies' (Dafoe 2015). This is probably a feasible path for historians of technology to adopt as for a historian, technological determinism is self-evidently untrue: human beings construct machines, not the reverse' (Williams 2002: 116). But for this study

which is from the point of view of a technology designer while designing an interface, I would prefer to assume that 'different processes could be at work on different scales of analysis (Leonradi & Barley 2010: 37). For certain widely spread technologies that change life practices of societies, there are definite patterns visible over larger scales of analysis that are not so apparent at smaller scales of analysis (Byrne 1998). Drawing a parallel in the history of media technology, while the origin of the printing press could be an outcome of social and cultural forces, the shapers of the technology would not have had the conscious control over the widespread usage of printed books and the manner in which it changed the forms of storytelling. Effects of such nature did not display themselves over two or three decades but over centuries and across the world. Also, I would like to assume that such dominant stabilized technologies then start being part of the socio-cultural systems and then consciously or unconsciously have a direct or indirect impact on how technology mutates to a newer form.

In recent times this aspect of the weakness in constructivist methodology has been corrected and studies are increasingly being done where macro level variables such as characteristics of the culture and cultural values or goals are accounted for in the technical frames of the technology designers or relevant social groups (e.g. Rosen 1993; Bijker 1992, 1995). But the question that is apt to ask for a methodological clarity is 'what cultural characteristics are the ones that need to be taken into account?' The judgement perhaps rests on the researcher as to what assumptions and criteria he or she uses for defining the cultural variables or cultural characteristics that would be used for the technical frames of the technology designers or even for the users who would use the interface. In accounting for the cultural values or goals, social constructivists would be reluctant to go to the extent of considering the social or cultural variables arising through the dominant use of a specific media technology like printing or writing over a long period of time. They would also find it difficult to explain certain emergent features of a technology can have consequences that are neither intended nor anticipated by any social group (Brey 1997). Though the scope of my study does not involve the unravelling of the long-term impact of the digital interface that I will attempt to build, it would be pertinent to account for the impact, if any, from the stabilized dominant technologies

from the past that have resulted in significant shifts in the media consumption culture of the society and how those cultural shifts form part of the technological frames of my own as the designer, or those of the users of the prototype. These pre-existing patterns of media consumption or technology usage often become part of our cultural practices over a long period of time and more often than not such widespread cultural practices whose origin is in a technology innovation influence relevant social groups and individuals when they try to build models for future technology practices. Such cultural practices can be seen as a kind of techno-cultural hegemony whose influences act seamlessly at a macro level along with other micro-level socio-cultural choices, practices, emergent features of the technology and economic and political forces to give shape to a technology that may either be successful or a failure for any of the contributing factors. The next step will therefore be to delineate certain cultural practices that owe their origin largely to a technology innovation in the past and will be used as frameworks of cultural variables for this study based on social constructivist methodology.

Media Technology and Media Culture

In his seminal work, *Orality and Literacy: technologizing of the word (1982-2002)* Walter Ong defines writing and printing as technologies that fundamentally transformed the human consciousness and culture. In reflecting on the effects of these technologies, he introduces the concepts of primary orality, secondary orality and literacy. Historically, human cultures have been pre-dominantly oral in the absence of writing. 'Untouched by writing or print' such cultures have been principally dependent on auditory sense perception and it limited the ability to express or think of complex ideas as there were no ways to store them, retrieve them as and when needed in their exact form. Ong (1982) defines such primitive cultures without any awareness of writing and print as being 'primarily oral' and differentiates it from 'secondary orality (which I will discuss later). Even though in this study I will continue to use Ong's historical segregation of media epochs as orality and followed by literacy, it must be noted that Ong's model does not account for the non-verbal visual media forms like rock-art that served the purpose of human communication much before spoken language matured to the culture of orality.

However, due to the lack of relevant media theories on non-verbal visual art forms that pre-dated orality and also for their incompatibly to this research, I assume Ong's model of orality and literacy to be the dominating media cultures that will be used as cultural variables. One of the most relevant aspects of Ong's ideas for this study is the transition from the culture of orality to literacy and what it means for technologies and the culture around them.

Ensuring the continuity of thoughts or stories in primary orality was dependent on the use of mnemonics and other memorizing techniques which formed a different form of expression than the analytical forms of written or print culture. The use of such specific mnemonic tools were put down by Francis Yates (1966) in the book called 'Art of Memory' and these tools were used in the formulaic structure of Greek epics like the *Iliad* and the *Odyssey* for enhancing the capacity of memory. However, the development of the art of writing which Ong describes as a form of technology is a specialized skill that has to be laboriously learnt, changed the style and structure of human communication and also the consciousness as a collateral impact. Human thoughts were transformed from the world of sound to the world of visuals. Techniques of memory and decision making which were dependent on proverbs, epic poetry and cultural heroes were replaced by linear, historical chronology of description. Thoughts and ideas could be transferred over time and place with exact precision as intended by the original author. But it should be noted at this stage, that the presence of writing as a skill in human society did not necessarily mean that the society as a whole had become literate. Early Greek societies had writing as a skill that remained limited within the group of scribes or elites and the majority of population lacked the skill even while being aware of it. This phase of transition in cultures from being oral to completely literate was explained by Ong (1965) as cultures with 'residual orality'. In fact Ong's (2002) explanation of 'residual orality' makes the argument that even when a new media culture is well established with its own set of conventions, the preceding culture never disappears in totality. But 'habits of thought and expression tracing back to preliterate situations or practice, or deriving from the dominance of the oral as a medium in a given culture', indicates a reluctance or inability to dissociate the written medium from the spoken' (Ong 2002: 314). Parallels can be drawn with digital cultures where even while the digital

literacies of different kinds progress to develop their own identity, they are not completely devoid of the features of earlier cultures like orality and literacy. Even while the functional features of digital platforms like mobile phones, mobile applications, skype or emails foreground their new paradigm of communication, they retain the fundamental features of orality and literacy in the background. The concept of 'residuality' can therefore be assumed to be an essential part of media innovation that consciously or unconsciously becomes part of an interface design problem and also how the interface is ultimately put to use by the users.

Ong along with other medium theorists like McLuhan (1962) and Havelock (1986) extend their explanations on the relationship between technology and culture by using the phenomenon of printing press technology and its impact on the socio-cultural practices. The innovation of the printing press by Gutenberg democratized the culture of 'literacy' ushered in by writing. A larger number of people across different sections of the society had access to a standardized format of written work which was now uniform in its font, regular spacing and hyphenation (Bolter 2001). Spelling, grammar and punctuation also became more consistent (McLuhan 1962) and because of this consistent viewing format, readers developed the conventions of reading and interpreting the writer's thoughts through a standardized and uniform media interface. The impact of the printing press on the culture of literacy has been under the lens as scholars have had different stances. Mass literacy did spread significantly in Europe due to the technologizing of printing and its capacity to produce a large volume of printed material and is also claimed to have transformed medieval Europe from an oral culture with limited literacy to a complete literate culture where reading became a silent and individual activity (McLuhan 1962, Havelock 1963, Ong 1982). Others like Eisenstein (1997) argue that Europe did not move from orality to literacy due to the printing press but only shifted from one kind of literacy to another kind. Whichever way we choose to look at it, the effect of printing press did fundamentally change the transmission mode of knowledge and paved the way for literary forms like novels, poems or comics to become popular forms of reading. In the word of Eisenstein (1979: 689) 'previous relations between masters and disciples were altered. Students who took full advantage of technical

texts which served as silent instructors... ' often surpassed the wisdom of their elders and ancients within a small period of time through the updated editions.

The discussion in this section was to establish the argument that dominant media technologies have a cascading effect on cultural practices and conventions at a given point of time and more importantly these effects on the culture do not disappear completely even when newer technologies replace older technologies. This argument will now substantiate the next layer of argument which has a direct relation to the design of new technologies and how pre-existing media cultures can have an impact on their evolution.

Remediation of technologies

While the printing press undoubtedly influenced our sense of knowledge acquisition and transmission and also our literary forms that continue even now, the origin of the printing technology is itself supposedly built on the foundations of the earlier technologies of hand-written manuscripts, paper, viscous oil-based ink and the wine press. Unlike what is widely believed, Gutenberg can be only credited for aggregating these technologies along with his own innovation of movable types. This phenomenon of building newer media technologies based on pre-existing technologies has been defined by Bolter & Grusin (1999: 23) as the process of 'remediation'. It can be seen in its most basic form with respect to the technology of writing where a newer medium like the electronic typewriter or a computer 'takes the place of an older one, borrowing and reorganizing the characteristics of writing in the older medium and reforming its cultural space." (Bolter 2001: .23). Bolter & Grusin (1999) in their seminal work on this idea of 'remediation' deconstruct the myth about the way 'new media' has been popularly been perceived as being completely new. According to them, new media tries to refashion pre-existing media through a new technology and this refashioning which they term as 'remediating' has happened earlier too when photography remediated painting, film remediated stage production and photography, and television remediated film, vaudeville, and radio. Ong's concept of 'secondary orality' is also essentially reflective of the same idea of 'remediation' when he tries to explain and differentiate the orality that has found its way into contemporary media forms like radio, telephone, television or even audio-books. Ong ironically observes that 'secondary orality is both remarkably like and

remarkably unlike primary orality' (1999). The secondary orality we find in our times has 'striking resemblances to the old in its participatory mystique, its fostering of a communal sense, its concentration on the present moment and even its use of formulas' (Ong 1971: 284-303, 1977: 16-49, 305-41). However, this form of orality is different from the orality in primarily oral cultures because it is 'a more deliberate and self-conscious orality, based permanently on the use of writing and print' (Ong 1982: 133). The oral nature of 'radio stories' may make it sound 'primarily oral' on the surface for the listeners but the production of the same is based on the written scripts that guides their production. The world of media is replete with examples of remediation and an example that would be the most appropriate in this context would be that of the e-books where the 'book metaphor' is used to create e-books and a novel that was written in the era of print literacy shapes up in its digital avatar in e-books. The initial trend of the e-books in directly adopting the print novel format onto a digital interface has been attributed by medium theorists as an integral part of the process of remediation where "the printers of incunabula works who, similarly lacking in new forms in which to cast their work, shaped them as closely as possible to manuscript form" (Welden 2012: 64) till a new form of storytelling found its own ground. Without any precedent of using the medium, it has often been seen that the 'new medium tries to do the same old things, duplicate previous activities, using the new medium' (Strate 2012: 9). McLuhan has used the metaphor of the 'rear-view mirror' (McLuhan & Fiore 1967) to explain this phenomenon in new media. The fundamental tenets of remediation are therefore perhaps a generic self-repetitive process that media interface innovators or designers succumb to without being conscious of the fact that they are resorting to it in their creative process of designing.

Relevance to the Design Practice

This brings us full circle to reflect on the fundamental questions that were stimulated by the storyline of the sci-fi movie called iRobot. What makes the designer individually or collaboratively think and conceptualize the robots' sense of logic and priorities in the way he or she does? Also, what goes behind the way the users or the people (Detective Spooner in this film) react to that technology? These

fundamental questions arising out of the movie stimulated the idea of building the digital interface "X" (that will be defined later) and finding ways to unravel the factors that influence the design and development of the interface "X" and the manner in which it is thereafter used by the trial users. The discussion so far on the relationship between technology and culture and the way remediation involves media technology designers borrowing from the pre-existing technologies points towards a need to have a finer look at the way interface designers conventionally approach design problems and analyze their user trials. This probably stems from the way design is defined and understood by designers themselves. The world of design is deeply divided over an acceptable definition of design. Some relevant definitions from Bill Moggridge's (2007) much acclaimed book "Designing Interactions" where he dwells on this lack of clarity on what design involves, are:

"Design is the difference between doing it, and doing it right"

> *Mark Fisher MP, Co-chairman, All-Party Group On*
> *Design*

"I believe design is an intention, purpose, plan; and that good design is therefore by inference, where such plan has been well conceived, and executed, and of benefit to someone"

> *Milner Gray, Designer*

"A plan for arranging elements in such a way as to best accomplish a particular purpose"

> *Charles Eames, Designer*

Bill Moggridge himself considers the third definition to be the most satisfying definition. However, a closer scrutiny of all the three definitions reveals that all have a direct or indirect assumption of a defined purpose and the success or failure is evaluated against that purpose. But none of these commonly accepted definitions allow the designer to know the way in which the purpose of the design gets its legitimacy, how the purpose is partially or completely a reflection of competing socio-cultural forces and not merely the commercial needs as defined by the purpose. They also do not reveal as to how the outcome of the design's use by the people at large is not a mere reflection of the designer's or the technology's

efficiency in arranging the elements but is also a reflection of the wider socio-cultural forces that impact the reactions of the users. The interface designers generically look at the design problem from the perspective of its functionalities and the trial data that gives a score on the performance of those functionalities. Accounting for the reality that designer/s, the technology and the users are part of the continuum of historical and socio-cultural forces where cultural conventions existing around the pre-existing technologies shape their choices and reactions is more often than not beyond the scope of any design exercise. This is precisely where this research wants to make a difference as it aims to see the exercise of a media interface design through a broader lens.

Summarizing the Theoretical Motivation for the Study

The underlying methodological philosophy of the study will be inspired by the social constructivist approach where the thrust will be on unpacking the impact that socio-cultural forces have on the development of the interface "X" and its usage thereafter by the trial users through their choices and contingencies. On the other end of the spectrum, the medium theorists (technology determinists) delineate the effects different media technologies may have on media consumption culture and the differences arising thereof. Juxtaposing the two apparently antagonistic theoretical stances, this study assumes a circular correlation between technology and culture where each impacts the other in direct or subtle manner.

I will assume that the phenomenon of 'remediation' in which new media evolves by refashioning older media technologies and media cultures, operates within this circular correlation of technology and culture. The cultural constructs of 'orality' and 'literacy' that have been posited by medium theorists as an outcome of the technologies of language, writing and printing will be used in this study as cultural variables that impact social actors or individuals in their role as technology designers or as users of the technology. The concepts of 'orality' and 'literacy' as posited by Ong (1982) have been thereafter extended by others to delineate the characteristics of the contemporary culture of 'virtuality'. The features of these different media cultures and their explanatory roles in this study will be detailed in later chapters.

While the two apparently antagonistic stances of 'technological determinism' and 'social constructivism' will be used in conjunction as the basic theoretical framework

for analyzing the design initiative in this study, there are a few niche theoretical stances that could be helpful in unpacking certain outlier phenomena that do not fit into the broad schema. One of the potentially outlier variables is that of the individual creativity and emotional commitment of individuals and also an individual user's personal choices and quirks in using the interface. Social constructivists would like to explain the 'interactions of individual actors such as engineers and users' through technological creativity that are linked to historical and sociological stories (Bijker 1995: 4). But social forces often don't explain the quirks and idiosyncrasies of individual human agencies as they don't fit into a strict theoretical model or socially constructed decisions and contingencies. The 'voluntarists' as a school of thought propose a philosophical stance that looks at such issues of human agencies by laying emphasis on the free agency, individual will, conscious thought process and choices (Chandler 1995). Voluntarists stand strongly against any form of determinism with the belief that people are not helpless against technology and its impact but are always able to make deliberate choices that can act for or against any changes (Chandler 1995). A corollary to the thought would be that individuals can vary widely in terms of decisions that they would take about a given technology development path or the manner in which they want to use a technology. Though it may not be possible to attribute all of these variations to cultural or social factors or even to constraints imposed by the technology itself, they do matter in the evaluation of technology and its relationship with the human users.

The 'voluntarists' do a relevant job of explaining individual idiosyncrasies in the development or in the use of a given technology but similar to that of social constructivism or technological determinism they do not account for the unintended consequences of technology or unintended chance developments of a technology in which individual human beings or social groups collectively did not act with agency. This is seen by some scholars as a function of 'chance' or 'indeterminism' (Toffler 1971: 214). Failure by human agents to make active choices or indifference of active uses to complex interacting technologies may also result in a sort of 'technological drift'(Winner 1977: 88f) that may alter the course of technology development and in turn have implications for human history that were not anticipated or called for.

Summing Up

The objective in this chapter was to use the web of theories having different degrees and types of determinism as a complement of each other to explain the linkage between technology evolution and the socio-cultural practices within which the technology designers and users thrive. However, it needs to be acknowledged at this stage itself that even if a multiple number of causal factors are being considered, an exploration of the contributory factors behind the genesis of a given technology always involves a degree of reductionism. The aim is obviously to be holistic, where we accept that the whole is more than the sum of its parts and multiple causal factors often act in abstract, non-linear and non-directional manner to give rise to a technology proposition. The crux of this discussion is that multi-causal determinism can often have better explanatory power than a mono-causal determinism albeit with its own set of limitations. It also gives me a larger number of tools in the tool box to analyze the data for teasing out the cause-effect relationships as I undertake the development of a media interface design. The theoretical motivation behind the development of the interface "X" and the overarching research question being established, I will now move on to the next step where I will unpack the basic purpose and nature of the technology interface "X" that will be used as an observational tool in this study. In trying to do so, I will initiate the next chapter by defining 'technology' that has so far been used as a reified monolithic term and hence needs to be teased out for future assumptions in analysis.

CHAPTER THREE

Deconstruction of the Technology and the Interface

The last chapter was focused on establishing the theoretical justification for the study by establishing the linkage between technology evolution and the socio-cultural practices within which technology evolves. The process of remediation that involves new media refashioning older media was also included to reveal the historicity involved in the evolution of technology. However, the technology interface "X" that will be developed in this study for observing the contributory factors as posited theoretically, was left undefined and needs unpacking in terms of the rationale and basic intention. Because the interface "X" will serve in this study as the physical manifestation of the reified term 'technology' and also as its representative, I will start by deconstructing the terminology itself. This will be followed by a discussion on the genesis of the physical shapes of technology artifacts and the primacy of the human 'intention' that gives shape to any new technology. Taking the cue, the intention behind developing the interface "X" will be detailed. Theories and factual information that inform the basic concept of the interface will be foregrounded thereafter.

Unpacking of 'technology'

Technology has been assumed by philosophers like Edmund Husserl and Martin Heidegger as a monolithic phenomenon with certain defining characteristics. Technology has also been referred to as 'technique' which broadly covers 'the totality of methods rationally arrived at and having absolute efficiency... in every field of human activity' (Ellul 1967: 5). While the umbrella term of 'technology' can be used widely to mean anything between technological concepts, technological theories, hardware and software, this study will be dealing with the idea of 'technological artifact' as the one to symbolize technology. The task of defining technology has been addressed from different perspectives. Initial attempts to define technology saw the contingency theorists defining it as a system of techniques (Woodward 1958) or as the job done in organizations (Perrow 1967). Contingency theorists looked at technology as comprising of people, processes and

machines all of which must be coordinated through a process to transform inputs into outputs. They however ignored the artifacts (like hardware and software) or the identifiable properties of artifacts. But contemporary theoreticians and practitioners of information technology aim at operationalizing technology as a constellation of techniques, processes and work practices' and focus on identifiable technological artifacts such as specific applications or digital hardware. However, I will first define the generic idea of an artifact and then go on to differentiate it from the idea of a technological artifact or more specific spin-offs from it.

Artifacts are generically meant to be objects like tools or weapons that are shaped or produced as a result of human effort. A more academic formal definition would be: 'an artifact is a physical object which an agent (or group of agents) creates by two, possibly concurrent, intentional acts: the selection of a material entity (as the only constituent of) and the attribution to X of a quality or capacity' (Borgo et al 2011: 220). This definition can be exemplified by the use of a pebble that is 'selected (and a quality is attributed) to create a new entity' (Borgo et al 2011: 220), a paperweight. While simple artifacts are a mere result of selection of any natural object by human beings and then using one of its intrinsic qualities to serve a purpose, a *technological* artifact cannot be a natural physical object that is selected for a purpose. This definition of technology assumes physicality as the essential part of 'technology artifacts' and therefore falls short of defining contemporary technology where a virtual interface created by software may lack the physicality that machines had in earlier eras.

A more efficient definition that can be applicable to contemporary technology artifacts would be the one proposed by Orlikowski (2000: 408) which proposes that a technological artifact is 'a bundle of material and symbol properties packaged in some socially recognizable form, eg. Hardware, software'. Orlikowski's definition differs from the contingency theorist's definition of technology in the sense that any artifact irrespective of being a huge machine or software has a materiality about it that is absent in 'systems of production or work flow integration'. Though technology artifacts are an integral part of production systems or organizational structure and one can have an influence on the other, they are eventually independent items because unlike artifacts, production processes or organizational structures are

social systems. The clarification that the technology interface "X" will hereafter be assumed as a 'technology artifact' is essential as researchers of technology often neglect the technology's material constraints and affordances (Latour & Woolgar 1986). Technology artifacts were not seen as independent items of analysis that are different from the production systems and social constructions of technology. However, the underlying assumption for my future discussions will be that the material characteristics of the digital interface have their own set of impacts on the reception of the technology and will therefore be treated as distinct from the socio-cultural factors that may impact the development and the usage of the interface "X".

Technology Artifacts: Why it is the way it is?

I reiterate the fact that designing the interface X for this study is not an end in itself, but is based on the objective of teasing out the contributory factors that shape the technology artifact in the form of Interface "X". In laying out the purpose and usability of the interface X, a recurring question has been asked both in the fields of humanities and sciences about the inspiration that resulted in a technological artifact being shaped in particular fashion or the precise germinating point of the idea itself. The same will surely be a question that would arise for the Interface X that I will attempt to build for the purpose of my research. This requires us to go back and revisit the idea of how technology has been believed to be an extension of the human organism. The fundamental idea that technical objects extend the human organism by mimicking or amplifying bodily and mental abilities has been posited notably by Marshall McLuhan (1964/1966), Ernst Kapp (1877) and David Rothenberg (1993). Though all three of them toy around with the same basic premise, there are certain differences in the perspectives and I will choose the one that seems the most compatible and plausible. McLuhan made the idea popular through his informal style in *Understanding Media: The Extensions of Man*.

> During the mechanical ages we had extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man – the technological simulation of consciousness, when the creative process will be collectively and corporately extended to the whole of

human society, much as we have already extended our senses and our nerves by the various media (McLuhan 1964: 19).

McLuhan's (1964) central contention about technology has been that technology is a replication, amplification or acceleration of functions that were originally performed by the human organism without the aid of any technology. As a corollary to that idea it can be said that in a situation where a technology artifact fails to achieve the desired acceleration or amplification, it is rejected as a technology artifact. McLuhan categorizes the extensions as extensions of the body or extensions of cognitive functions. While the technological artifacts of the mechanical age like spears, knife, clothes are based on the extensions of the body, the media technologies like radio and television were seen by him as the extension of the senses. The futuristic technologies of the digital age which were not present at his time were envisioned by him as 'extensions of the consciousness' which probably refers to digital and virtual technologies where 'human intelligence and creativity would be automated and translated into information functions' (Brey 2000 p.3) carried out by technological artifacts.

Much before McLuhan, philosopher Ernst Kapp (1877) posited an idea that is similar but his position was different from McLuhan in the sense that he saw all technological artifacts as projections (instead of extensions) of human organs. Unlike McLuhan who saw technological artifacts as translations of human faculties in amplified forms, Kapp believed that they were mere imitations of human organs. In contrast to both McLuhan and Kapp, David Rothenberg (1993) published his work thirty years after McLuhan and argued for the position that technology artifacts are an extension of humanity and 'can extend all those human aspects for which we possess a mechanical understanding, that is we know how it works'(p.16). Very similar to McLuhan, Kapp posits that technological artifacts can be classified into two categories: faculties of action and faculties of thought.

When all these three perspectives (McLuhan Kapp and Rothenberg) on technological artifacts and their origin are seen together, it can be said conclusively that in spite of several examples of artifacts that seem to follow each of the models, there are several counter-examples like 'electric lighting' or 'electromagnets' that would need far-fetched logic to show any connection to human morphology or

faculties. While these counter-examples do defy such overarching models to explain the origin and designs of technological artifacts, the idea that does stay afloat from Rothenberg's assertions is the idea of technology artifacts as an extension of human intention or desires. The starting point of all technological artifacts, ranging from the primitive knife to the modern digital applications, is driven by the premise that 'when we make something, we thrust our intentions upon the world' (Rothenberg 1993: 16). It is this 'intention' or 'desire' that gives us the wings to fly or to dive into the depths of the ocean or to explode a mountain to create a tunnel. The fulfillment of the 'intention' or the 'desire' may result in the technological artifacts being shaped morphologically or functionally similar to human organisms or to other organisms and natural artifacts that we see around us. But these similarities arise more out of relative design advantages or sometimes are matters of coincidence.

I will therefore pick up Rothenberg's assertion about 'intention' being the primary force behind the genesis of a technological artifact and lay bare my broad 'intention' behind developing the interface "X". In the simplest term, the interface "X" will seek to remediate the oral storytellers that served as the dominating medium in the era of primary orality into a digital interface through 3D embodied agents. It must be admitted that Rothenberg's assertion about human 'intention' being the starting point for the genesis of any given technology artifact has a degree of subjectivity inherent in it. To that extent my intention to remediate oral storytelling also is a subjective choice as there are a plethora of remediation options that are available. But nonetheless as a chronicler of this technology interface development, it is worthwhile to mention that the apparently subjective choice has been partially stimulated by the scope that the choice offers for observing the complexities of remediation.

Remediating oral storytelling that is one of the oldest forms of storytelling cultures into a digital interface that is at the other end of the media technology continuum opens up an interesting exercise in marrying two extremities. It is also interesting to note as an afterthought that McLuhan and Kapp's observations about technology being driven by the aim to accelerate or amplify the functions performed earlier by unaided human organisms can be traced behind this intention of remediating an oral storyteller. Contemporary technology offers an array of options that can possibly

accelerate or amplify the effectiveness of oral storytelling performances which even in the digital era holds an attractive promise. The resurgence of orality in the contemporary era in the remediated form of audio books, podcasts, and digital storytelling holds testimony to that fact. While I will provide some detailing in the upcoming sections about oral storytelling, its historical relevance and its contemporary resurgence, it should be noted that this dissertation is not specifically about oral storytelling. It is focused more on the process of remediation that has occurred in the storytelling media forms and using this specific remediation opportunity to tease out the contributory factors that impact its genesis and reception.

Acknowledging the fact that the world of storytelling in the current context is extremely diverse and complex with multiple media choices that satisfy multiple needs, I will therefore narrow down my explanation to the historical progression of orality to the dominant media culture of literacy and its implications for remediation. To elucidate the idea of remediation in the arena of storytelling form, I will use the test case of e-books where there has been a conscious effort to remediate print books into a digital interface.

From Oral Storytelling to the Contemporary Flux in remediation

While language may have originated anywhere between fifty thousand years to a hundred thousand years ago (Atchinson 1996), the earliest record of human writing and reading dated back to six thousand years (Manguel 1996). Human efforts at storytelling can be seen from the pictorial histories on caves and 'as language evolved storytelling became an increasingly aural activity' (Hurlburt & Voas 2011: .4). Oral storytelling served to sustain and propagate cultures, myths and stories of heroism and was often transmitted by word of mouth from generation to generation. 'Early (wo)man thus lived in acoustic space' supplemented by limited visual storytelling 'that were localized, without broad cultural reach' (Hurlburt & Voas 2011: 5). Traditionally a storyteller served the multiple purposes of entertainer, teacher, historian or a healer (Pellowski 1990). Oral literariness is fundamentally created through the performance and that performance is independent of the verbal literary text, and consists of a range of multimodal dimensions and processes which give rise to certain different forms of literature (Swann 2006). While oral storytelling

performances allows the audience to be co-present in the event and moment of telling, technologically mediated forms of storytelling create a separation between the source and the receiver through time and/or space (Lwin 2010). Orality has found its way back indirectly into the modern storytelling forms through certain remediated forms like audio-books, podcasts, radio stories and digital storytelling. The increasing popularity of aural media forms can be gauged from some of the market statistics for products like audio books and podcasts. Figures published by Audio Publishers Association show that total sales of audio books have increased by 22.7% in 2017, to an estimated $2.5 billion, over an estimated $2.1 billion in sales in 2016. Unit sales also rose an estimated 21.5% (Maher 2018). Market studies done on podcasts by Nielsen reveal that 50% of all US homes are podcast fans and within that the number of 'avid fans' were 16 million homes in the fall of 2017, an increase from the 13 million homes who identified as 'avid fans' in 2016 (Winn 2018). In recent times, oral storytelling performances in their traditional form have also proved their usefulness to certain socially relevant communicative processes through their small scale interactions (Lwin 2010).

However, going back to the historical progression of media cultures, human storytelling took an interesting deviation when in the middle of the fifteenth century the innovation of the printing technology in which Johannes Gutenberg played a prominent role, ushered in the culture of printed books that continues even today. Printed books in their early phase borrowed their content heavily from the stories existing in the oral tradition. *Panchatantra* from India, *the Arabian Nights*, *the Decameron, Homer's Odyssey* and *Iliad*, Chaucer's *Tales of Canterbury* are examples of such remediation. Novels as a form of storytelling were a product unique to this phase of printing technology and were 'not simply oral storytelling in print form' (Weldon 2012: 57). Novels ended the era of 'reinforced communality…of earlier oral and literary forms'(Skains 2010: 96) and brought in a 'new kind of individuated storytelling and story consumption separating the reader from the writer in a way previously unseen'(Welden 2012: 57). This phenomenon of the content being remediated and taking on a new form in response to the requirements and attributes of the new medium has been talked about by Marshall McLuhan and expressed through his famous aphorism 'The medium is the message'(1964: 23).

This phenomenon of remediation has thereafter recurred with each new advancement of media technology. With respect to the world of storytelling (which is my primary area of concern), films remediated stage production and photography, radio remediated different kinds of oral performances including oral storytelling, television remediated film, vaudeville, and radio. Indirectly, they can be said to have remediated oral storytelling or the format of books as the media of storytelling. But for the purpose of this study, I will narrow down the critical observations on such remediation to the ones that have direct correspondence to the remediation of orality or printed novels that ended the dominance of oral cultures by remediating orality in certain ways. Therefore while acknowledging the role of movies, television or radio as popular and thriving options of storytelling, for the purpose of laying down the conceptual guidelines that inform the design of the intended Interface "X", I will focus on the potential of remediating oral storytelling in the digital era by frequently referring to the remediation that has taken place in case of e-books, audio books, and podcasts as test cases.

The new form of the printed novel in its e-book format came into existence around two decades ago and with the different versions of e-book readers reflected a definite technological change. However, they were 'nothing comparable to the transformational changes of the internet or other landmark products' (Herther cited in MacWilliam, 2012, p. 14) like the iPad, iPod, desktop publishing or digital music. From the initial failure of the adoption of e-book readers like Kindle (introductory versions) to the relatively successful acceptance of their later avatars in Kindle DX, Nook or Sony e-book readers or iPad e-book applications, e-book designs have undergone a wide range of experimentations with functionalities in order to evolve into a feasible option for a regular reader. However, they have not yet gained ready acceptance or have not become an accepted norm for reading novels in spite of the earlier predictions for the demise of the printed novel. The staggered growth of e-books in recent years can be observed from the trade figures resulting in a considerable churn around the future of the e-book technology. According to the sales data published by the Association of American Publishers, e-book sales growth dropped from the explosive 252 percent in the first quarter of 2010 to 28 percent in 2012 and then to 5 percent in the corresponding period of 2013 (Irwin

2013). The drop in sales continued as the UK Publishers' Association figures show a fall in consumer eBook sales of 17 per cent in 2016, while physical book sales rose 8 per cent. Similar drops in the e-books sales were seen in the US where unit sales of traditionally published e-books fell 10% in 2017, compared to 2016 results where e-books accounted for 19% of total units (both print and digital) in 2017, down from 21% in 2016. (Milliot 2018).

The relative dissatisfaction with the initial forms of e-books and enhanced e-books has been traced by many researchers to the reason that they are 'caught between two worlds and they are unable to adequately function in either' (Weldon 2012: 64). This has therefore raised overarching research questions about reading in the digital age and about the future of the fiction novel in particular (Butler 2009; Weldon 2012). The publishers and researchers have followed divergent paths for the solutions. While one path has led to 'emulating the print book' as closely as possible and 'making the reader experience as satisfying as possible' (Butler 2009: 3), the other path is to 'abandon the idea of the novel' and instead work around the generic space of storytelling as a fundamental human cultural phenomenon (Welden 2012: 64.).

The former path of emulating the print book has inspired a significant amount of academic research on studying consumer preferences between different brands of e-book reading hardware (e.g. Clark et al. 2008), e-book users and user experience (MacWilliam 2012; Shin 2011), design alternatives for e-books (Chen, Guimbretiere & Sellen 2012), and implications of the e-book on readers and reading as a practice (Herther 2012). While most studies over the last two decades have reviewed the development of e-books in terms of functionalities like memory and navigation, screen resolution, navigation and control, battery and power and whether e-books would become a feasible option accepted by all forms of readers (MacWilliam 2012), there are some studies that focused specifically on e-fiction usability (Malama, Landoni & Wilson 2005) and some others on human-centric user experience (MacWilliam 2012). Studies with more specialised focus on interaction design of e-book readers and applications have looked at cognitive maps to improve navigation (Li, Chen & Yang 2013) and broader issues of visual rhetoric of design. Most of these studies have been done within the broad assumption of the idea that

'adherence to the paper book "metaphor" increases the subjective satisfaction of the reader' (Landoni & Gibb 2000). The adherence to the paper book "metaphor" has essentially meant that novels on e-books have followed the essential look and structure of the traditional book. Only a few studies in the initial years indicated the possibility that there may be a scope of looking at the alternatives for the traditional book "metaphor" in trying to remediate the printed book on digital interface.

The research in the other direction has tried to look at how the ongoing changes in the medium have resulted 'in a major change in the form of the content' and also challenged 'the norms surrounding the author reader dynamic and the role of the individual in reading and writing established by print' (Weldon 2012 p.57). The initial trend of the e-books in directly adopting the print novel format onto digital interface has been attributed by such research as an integral part of the process of remediation where in the initial phase of remediation there is a tendency to mimic features of the original medium, very much like the printers tried to mimic manuscript form (Welden 2012 p.64). There is thus a widely accepted realization that 'we are at the inflection point where we bring our analog expectations to digital. …and 'we don't have a model for a digital reading experience' (Kostick 2011, p.137). This has spawned interesting initiatives of storytelling in the form of hyper-text fiction, mobile narratives, digital storytelling (DST), audiobooks and radio stories. While mobile narratives and collaborative storytelling are still new initiatives that are in the experimental phase and lack any credible trade figures globally, hyper-text fiction has remained 'a rather esoteric field of interest' (Mangen 2008: 408). This is even 'after two decades of considerable theorising and creative activity' and the proponents 'announcing hyper-text fiction as the ultimate manifestation of the future of literature' (Mangen 2008: 408).

Compared to these new forms of storytelling through digital interfaces, the form of audio books has shown considerable potential in spite of being simplistic in its original form. The steady and robust growth of audio books as indicated earlier in the chapter has been maintained through the last decade making it a currently a $2.5 billion industry, up from $480 million in retail sales in 1997 (Maher 2018). This assumes importance as we see the sales of e-books continuing to see a consistent decline over the last 4 years as indicated by the trade figures provided earlier. A

digital renaissance of audio books in recent years has changed the boundaries of the audio book reader from being associated with children or with visually impaired or dyslexic users to a wider spread of listeners from all the age groups and categories in the population. The listener demographics show that 54% of audiobook listeners are under the age of 45, split almost evenly between male and female. However, an interesting shift that is worth mentioning in the context of remediation is that 47% of listeners used a smartphone as their listening device for audio books, up from 29% in 2017 and 22% in 2015 (Maher 2018). This has a subtle connection to my earlier argument about the materiality of a technology being given its due importance. Listeners shifting from PC or dedicated audio-book players to smartphones for listening to the same content perhaps reflects a change where the materiality of the technology interface makes a difference in the choices that people make. Though this market statistic is not directly related to my research area, it needed a mention in the context of orality in the current digital era and to portray a picture of the flux in the media consumption choices. '

In response to the increased popularity of audio books and the desire for interactivity as a cultural phenomenon, the technology of audiobooks has also started evolving using the affordances of the digital technology. There are options for 'interactive audiobooks, in which the listener/player can intervene with the story at pre-defined and user-selected points using an auditory interface' (Have & Pedersen 2013: 124). Digital storytelling (DST) goes a step ahead of audiobooks in combining 'the art of traditional oral storytelling with multimedia elements such as images, graphics, music, and audio in order to present a narrative with a personal voice (Porter 2004). When compared to audiobooks, digital storytelling probably represents more authentically the reality of the digital era where along with the resurgence of the individual acoustic space as used by the oral storyteller of the Homeric times, media consumers are also 'lurking voyeurs, watchers of all things, and our appetite for visual stimuli increases daily'(Butler 2009: 5).

Apart from audio books and digital storytelling, the new media form of podcasts has been another disruptive spin-off from the digital revolution that has converged 'audio, the web and portable media devices' and has forced the radio business to reconsider some established practices and preconceptions about audiences,

consumption, production and distribution' (Berry 2006: 144). Podcasts as such is meant to be 'an overarching term for any audio content downloaded from the internet either manually from a website or automatically via software application' (Berry 2006: 144). But the downloading via applications has proved to be the disruptive new form of distribution that has been more commonly referred to as podcasting. The similarity with other forms of remediation discussed earlier is that podcasting is essentially about retrieving the culture of the radio and using this powerful and convenient technology to propagate content in the way users want (Twist 2005). Podcasting is a unique form of media where orality has been remediated in a way that is different from radio as it is flexible about space, time and content. In terms of its characteristics, it lies somewhere between broadcast radio that is a push medium and internet radio which is a pull medium (Berry 2006). The content of a podcast is selected (pull) by the user's subscription choice, arrives to the subscriber by 'push' mechanism and then is used by the subscriber at his or her convenient time (pull). The increasing usage of podcasts is reflected by the research data for the year 2018 published by Edison Research ("the podcast consumer" 2018), a pioneering market research firm in the field of media. 26% of the Americans aged 12 and up have listened to podcasts on a monthly basis which is almost equal to the twitter active user base. The listener percentage was a mere 9% for the year 2008. The more interesting aspect of this research is that the increase in this percentage of listeners is being fuelled by mobile devices. For the year 2017-2018, 76 % of the podcasts were being listened to through a smartphone or a tablet and 24 percent through computers. This is a drastic change from the figures in 2013 where the figures were 42% and 58 percent respectively for smartphones/tablets and computers.

The restoration of the traditional art of oral storytelling in the digital era can thus be observed to varying extents from the popularity of media formats like audiobooks, digital storytelling (DST) and podcasts. The increasing popularity of audiobooks and radio stories has brought into debate the possibility that spoken words have the potential to 'restore literature to its oral roots' and 'bring back the intimacy of the storyteller' (Rubery 2011: 12). The traditional form of oral storytelling resurfacing in different formats as discussed above has been seen as an essential characteristic

of media evolution where the new media borrows from the older media and creates new platforms for media consumption. However, the 'digital renaissance' of a medium like audiobook 'over the past few years' and the role that it has played in the revival of the traditional art of oral storytelling in the digital age has been 'an overlooked aspect of the history of the mediatisation of the book' (Have & Pedersen 2013: 124). Research in the area has 'been sparse' and 'unexplored' in spite of its growing popularity across diverse user groups (Have & Petersen 2013: 124). It has been hitherto neglected due to its unfavourable status when compared to printed books and the debate over whether we can really 'read with our ears' (Rubery 2011: 12). With the redefining of reading norms in the digital age where the acoustic and visual space have gained in importance, the sharp growth of media like audiobooks cannot be ignored when a media technology designer tries to create a conceptual map for a new media platform for storytelling. This becomes more potent when the affordances of the audiobook or podcasts are coupled with the visual stimuli of digital multimedia and interactivity as seen in digital storytelling. But both audiobooks and DST use limited aspects of the oral traditions of storytelling. While audiobooks and podcasts use only the aural aspect of the oral tradition to narrate fiction, DST have remained limited as a form for communicating personalized stories without an active multi-modal presence of the oral storyteller. In a scenario where there is an emerging perception amongst media researchers that we 'have no widely accepted digital form such as the novel or the oral story in which to house digital tales' (Welden 2012: 64), there is a scope for media interface designers to reflect on how media theories look at the connections between technology and media cultures in order to understand the process of remediation.

The discussion in this section lays out the flux in the arena of story consumption where media forms like e-books, audio books, DST or podcasts originate out of attempts to remediate earlier media technologies. For the purpose of this study I have left out other storytelling platforms like movies or television as their connections to oral cultures are more indirect than the ones I have considered for discussion. However, the flux discussed so far raises certain potent questions in the context of this study. What do these different forms of remediated media interfaces mean in terms of the human reception? Are these different media forms mere

random innovations that mean the same for the media consumer or do they create a fundamental difference in the way the story is consumed? What difference does it make for the story consumer if the same story is being read through an e-book against hearing it through an audio book? Medium theory tries to address these fundamental questions about why and how different media forms make a difference to the media consumer and has a bearing on the message that is being conveyed.

Medium Theory

Continuing from my earlier discussion, which has already introduced the relevance of medium theory from the perspective of determinism, the relevance of the theory is also in the fact that it focuses on the individual characteristics of each medium or technology and explores the manner in which these unique features of the medium make it different from other mediums that are already there or existed in the past. It explores the manner in which each different era of human communication medium (oral, writing/printing, and electronic) is typified by its own interplay of human senses and has its own style of thinking and communication (McLuhan 1964). McLuhan posits that every medium needs its own style of behaviour and therefore an intense performance that works well on the 'hot' medium of radio may seem very wooden in its delivery on the 'cool' medium of television (1964). McLuhan also points out that the shift from orality to alphabetic literacy, crystallised more by the advent of printing technology shifted the focus from acoustic to visual space. Media according to him played the crucial role of extending or amplifying certain elements of our sense perception. Different sense perceptions in turn have different biases in the very same way as different media have different biases. For example, the sense of hearing places us in the centre of things with all the three hundred and sixty degrees around us and we are in a 'subjective and ecological relationship' with the surroundings. The power of vision, on the contrary makes us an outsider looking as an alienated voyeur (Strate 2012: 3). This can be seen from the manner in which electronic media like television shifted its content to suit the bias towards visuals instead of the bias towards aural sensory perception showed by the radio. Though McLuhan correctly pointed out the sensory bias of each media, he might not have visualized the contemporary diversity of media choices where media consumers as individuals and as a community choose different media interfaces based on the

sensory stimulation that is appropriate for a given situation. The annual report of the Audio Publisher's Association which I have earlier mentioned with regards to growth of audio books points out that 83% of frequent audio book listeners also read a hardcover or paperback over the last 12 months, and 79% also read an e-book. Medium theory's strongest implication for the interface designers probably comes from realizing the fact that every different media interface has its own unique manner of delivering the content and even while the basic purpose of the content remains the same, the media interface makes a difference to the way it is received and consumed by the users. This understanding will be used later in the dissertation to analyse the results of the interface trial.

Harold Innis, who can probably be credited with the role of being the precursor to medium theory, argues in *The Bias of Communication* (1951) that each technology and medium has its own bias. Thus writing on heavy media such as stone and clay tablets is connected with a bias towards preservation over time. Writing on lighter media such as papyrus and paper is biased towards transmission over space. This bias of the medium which also applies to new media in the current context 'does not determine how it is used, but does represent limitations of how it can be used and indicates what it is best suited for' (Strate 2012: 2). For example, radio cannot be used to broadcast images and printed books cannot be used for a two way dialogue but unlike digital books, can be used as personal memorabilia. The bias thus can be seen as 'a statistical tendency for a given medium to be used in a particular way' (Strate 2012: 2). This understanding of new media gives us the fundamental framework in trying to understand any new interface design, its usage and its success or failure in achieving its desired goal from a broader perspective with more reasonable assumptions about an interface's bias. Understanding the bias of the interface or the technology is critical for interface design as a failure to acknowledge the bias may lead to conflicting ideas about the nature of an interface design problem. This was seen to an extent in the case of e-book design (discussed in the earlier section) where there have been extensive debates around the appropriateness of applying 'book metaphor' on to a technology that is fundamentally different from that of printed books. Medium theory from another perspective offers an explanation for this phenomenon of a new medium trying to

appropriate a metaphor based on an older medium and provides an insight into the mechanism of remediation process that applies not only to e-book design problems but essentially to any remediation process.

Medium Theory and the Complexity of Remediation

In trying to critically analyse the way digital technology has attempted to remediate printed books through the use of the 'book metaphor' and its implications, it is interesting to see the explanation provided within the framework of medium theory. Picking up on McLuhan's 'rear view mirror' concept, Bolter and Grusin (1999) carry forward the same idea in their seminal work on remediation and point out that an older medium can also remediate a newer one. According to them, the 'representation of one medium in another' is 'remediation and while 'remediation is the defining characteristic of the new digital media', it is not unique to digital media but was also done historically by new media of previous eras (Bolter & Grusin 1999: 45). Bolter & Grusin further lay down certain generic characteristics that typify the process of remediation with the ideas of 'immediacy' and 'hypermediacy'. They assert that the effort of any new media through a newer technology is in trying to erase its conscious presence and put the viewer in the same relationship to the content as she would if she were in front of the original medium (1999). This underlying goal that drives the design of every new media has been defined as 'immediacy'. For example, photography tried to give a more realistic and therefore transparently immediate experience of the original than what was given by painting. The same holds true for movies which wanted to be more immediate than still photography. On the other hand, 'hypermediacy' is the dialectical opposite of 'immediacy'. Even while every new media tries to erase the presence of the media by bringing the viewer or user as close to the real as possible, the user is subconsciously aware of the medium that is aiming to provide the immediacy. 'Hypermediacy' is a style of visual representation whose goal is to remind the viewer of the medium" (Bolter and Grusin 1999: 272) and become aware of the act of using the medium. One of the common life examples of 'hypermediacy' is when we are watching television, updating twitter status through the smartphone at the same time and also listening to music through an mp3 player. We are conscious of the act

that we are using different media and yet enjoy the immediacy that each media provides in its own unique manner.

The medium theory and its perspectives on the act of remediation thus help us to understand how the medium or the materiality of the technology may influence the reception of the message itself. The idea of remediation also provides a macro framework of understanding the mechanism through which new media forms evolve by borrowing from each other and the underlying goal of achieving 'immediacy' and 'hypermediacy' (albeit in different ways) that connects them in a single thread. The difference that is created by the affordance of the technology or the physicality of the medium will now be explained through the example of e-books and printed books where the differences in the technology of the medium play a significant role in the reception of the content. The operative principles of remediation can also be seen at work when we compare the two media forms as one is the remediated version of the other.

Same Content but Different Medium: Paper Books versus E-books

If we look through the large expanse of studies that have been done to understand the reasons behind the reader's choices between a conventional paper book versus an e-book (content being the same for both), there are two broad themes that dominate the research: subjective emotional needs and gratifications from a printed book and the objective usability or functional comparisons of the two media. While the former is fundamentally a socio-cultural construct, the latter is a comparative analysis from the technological perspective.

When Vershbow (cited in Burritt 2006: 4) finds the print books to be more versatile than their 'compromised' counterparts: e-books, it is because the reader's emotional connection with a book can be discovered by the fact that they 'like turning the pages', or share the books whenever they want, scribble notes, make dog-ear book marks and even go to the extent of remembering when one has 'spilled tea on page 136'. Roxburgh (cited in MacWilliam 2012: 24) accepts the emotive factor when he says that 'what we really love about books is the content, which is unique and perishable. But we emotionally attach to objects.'

Consumer usability studies done for a research project at Johannes Gutenberg University, Mainz (University 2011) compared the use of different types of texts on an e-book reader (Kindle), a tablet PC (an iPad) and on paper. The results of the study are perhaps a testimony to the complexity of remediation. Though almost all the participants (both from the young and elderly groups) in their self-reporting found the printed text on paper the most comfortable to read, this did not match with the data from the study. The reading behaviour and the participants' corresponding neural processes were measured through concurrent measures of eye movements (eye tracking) and electrophysiological brain activity (EEG). The criteria for analysis were changes in the theta frequency band power, reading behaviour, text comprehension, and information recall and the participants' preferences for the respective medium. Though there was no significant difference seen from the data in terms of reading for these three different platforms, information processing was found to be faster through tablet PC than e-book reader or paper

However, researchers like Kang et al (2009) say that reading from an electronic interface like a Kindle or iPad is completely different from reading a printed book and such electronic interfaces have negative effects on reading efficiency and result in higher eye fatigue. Carreiro (2009) on the other hand is supportive of e-books and believes that they are advantageous in terms of creation, revision, dissemination, and use and access control.

The evaluation of the two media becomes more pointed when the distinction is made between reading fiction and non-fiction on an electronic interface. The EBONI project ('EBONI' 2002) was the pioneering project that defined a set of best practice guidelines for designing electronic text books in general without making a clear distinction between fiction and non-fiction books. Developing functionalities suitable for academic or professional reading has been seen as more challenging as 'the reading activities that knowledge workers and students engage in tend to be more complex than those that characterize for leisure' (Chen, Guimbretiere & Sellen 2012, p.18:1). Users of academic or professional e-books have found that 'current electronic reading solutions still fail to provide the wide range of functionality' that this sort of 'active reading' demands (Chen, Guimbretiere & Sellen 2012, p.18:2).

In contrast to the reading process of non-fiction readers outlined above, the reader of fiction 'steps off the connecting path of the linking texts on internet or new media functionalities' and 'disappears into a kind of narrative mist of the story itself, silent and alone' (Mackey 2001: 187). Going deeper into how these differences apply in the age of digital reading, Mackey's (2001) study on three fiction series in the fantasy genre (one of which is the Harry Potter series) throws up many interesting questions about reading fiction and the differences that arise due to difference in the medium. Mackey (2001: 170) looks at how readers of fiction are influenced by the 'cover page illustration', the different editions like 'hardback, mass market paperback, and trade paperback' and also what the first page of the novel offers in singularity. People regard the reading of a printed book as an experience - leafing through the pages, annotating it by hand, or even smelling the paper - and thereby engages in direct interaction with the text (Burritt 2010, p.44), but reading an e-book necessitates the physical interaction of the reader with the technology vehicle and thus may lead to the creation of distances between the reader and the text (Mangen 2008). When one reads fiction e-books for pleasure, 'the process is closer to the process of reading a traditional book', where users mainly move forward in a linear fashion, and some situations move back to see the earlier pages (Schcolni 2001: 69). The exact similitude of the process of reading in traditional printed books and fiction e-books has led to the constant dilemma in the mind of the readers as well as the researchers regarding the appropriateness of using the 'book metaphor' in the interface design and if any substantial gains have accrued to the reader thereof. This is where we start seeing the role that metaphors play in understanding a medium by the users and adopting it as a part of the media ecosystem. It should be noted that the role of metaphors in differentiating a new medium can be seen as a spin-off from the medium theory where the technology of the medium is given an identity through the help of the metaphor and this identity in turn positions the technology in the human framework of understanding. Thus the use of metaphors in an indirect manner becomes an important tool for a remediated interface to be made acceptable to the users.

Metaphors have historically been an integral part of interface design with the easiest example being the 'windows' metaphor for Microsoft software. Metaphors have also

been instrumental in human being's conceptualization of technology interfaces and also impacted its subsequent interpretation by the users. However, the fundamentals of applying a metaphor in Graphical User Interfaces (GUI) and the theory of conceptual metaphors that powers it need to be understood in greater detail for suitable application to alternative interfaces for storytelling.

Theory of Conceptual Metaphors

The theory of conceptual metaphors gives us the understanding that metaphors are vehicles that help us to understand one conceptual domain in terms of another. An example of such conceptual metaphor is 'our relationship has hit a dead-end street' where the metaphor dead-end street involves 'understanding one domain of experience, love, in terms of a very different domain of experience, journeys' (Lakoff 1993: 206). Though metaphors as a linguistic tool have been researched earlier, the idea of conceptual metaphors was first explored by George Lakoff and Mark Johnson in their book '*Metaphors we live by'*. Conceptual metaphors, unlike what was thought about metaphors earlier, are not only a means of communication but also have impact on our thoughts, actions and a means to conceptualize the world around us (Reddy 1979).

Metaphors have been an integral part of interaction design for Graphical User Interfaces (GUI). Interaction design has been a process of figuring out the manner in which users will interact with electronic devices through graphical icons and visual indicators. The interaction design for e-books has from its very inception until the most recent iBook application been based on the 'book metaphor'. It has been found in earlier research that adherence to the paper book "metaphor" increases the user's subjective satisfaction' (Malama, Landoni & Wilson cited in Chong, Lim & Ling 2005: 213) and at the same time one has to 'take advantage of the interactive power offered by computational technologies' (Rowhani & Sedig cited in Chong, Lim & Ling 2005: 213). Before I explore the use of the 'book metaphor' in detail and the research questions arising thereof, it is important to see the general principles of interaction design process that have been followed by GUI designers.

Interaction design progresses through the hierarchy of 'idea', '"metaphor"', 'model' and 'display' (Verplank cited in Moggridge 2007: 131-134). The 'idea' of interaction design comes from the motivation to solve a problem or error. It also can be

motivated by an ideal, the ideal 'that we have for making the world wonderful' (Moggridge 2007: 131).

The next step is to find a '"metaphor" that connects the motivation' to the final outcome of the design that we want to create (Moggridge 2007: 131). The "metaphor" is a 'rhetorical tool' that makes it easier to express 'difficult concepts by referring to simpler objects which have the same qualities' (Landoni & Gibb 2000, p.194). Possible 'models' arise out of the 'metaphor', and these models have an accompanying set of tasks that need to be done for the model to work. The final step in the process is the 'display' or the physical representation of the model and the tasks that get done through the display and its accompanying controls (Moggridge 2007:.131).

Out of the four steps outlined above, the one which has been widely debated and central to the research on e-book user interface design is the idea of "metaphors". The idea of "metaphor" in GUI interaction design has seen a critical debate both in favour and against and has a controversial presence in the world of designers. The desktop "metaphor" is the term that became popular with the success of the GUI and closely linked to the world's most successful software product, Microsoft Windows and traces back to the research and development groups at Xerox, and then Apple who were working on the modern GUI. However, in the last twenty years the indiscriminate use of the tool and certain commercial failures have made some realize the sagacity in warnings that had come in the very early days of digital revolution where 'searching for that magic "metaphor" is one of the biggest mistakes you can make in user interface design' (Cooper 1995: 53). But the words of caution from researchers like Cooper (1995) need to be seen in the right context and not seen as an outright rejection of the utility of metaphors. Using metaphors does not guarantee the success of an interface as there may be reasons beyond that of the metaphors for the success or failure of an interface. Also, the appropriateness of a metaphor chosen for an interface may need to be questioned before one rejects the utility of metaphors in interface design. The success through building metaphorical Desktops and Windows led the designers and human computer interaction specialists to use "metaphors" more overtly for designing UIs and it resulted in some significant failures like Magic Cap of General Magic (a

Palmtop Digital Assistant operating system that used a room metaphor to perform different tasks) and Bob of Microsoft (a software product based on room/house metaphor). It was found that the 'extra-realistic pictorial "metaphors" did not succeed to the same extent that the relatively abstract "desktop" and "windows" "metaphors" had' (Blackwell 2006: 492). However, with all the criticism and debates about its use, the theories of conceptual "metaphor" as initially posited by Lakoff and Johnson in 1980, have been consistently used till the current time by designers and researchers as a creative tool for visually representing computer abstractions.

Using the discussion on the concept of metaphors and their use in GUI design, I will now examine the use of the 'book metaphor' in e-books. The purpose of providing empirical facts about the use of metaphors in e-books is to take cognizance of how interface designers attempted to remediate the printed book through the application of a metaphor (of the book itself). The discussion also intends to reveal the complexities inherent in the process of remediating a storytelling media interface that is not limited merely to the interface's hardware and software technology in strict material terms but also how the materiality of the technology is understood within the symbolic framework of the users' culture.

Book "metaphor" in e-book Design

A question that has been debated intensely in recent times: Should the e-book mimic the reading experience of a printed book or should the interaction designers attempt to create a new form of reading that uses the strengths and functionalities of the contemporary technology to devise a different reading paradigm? Since the earliest phase of e-book research and interaction design, researchers and designers have chosen the former as the basis for their hypothesis and applied it both for fiction and non-fiction e-books. Landoni & others (2000: 407) state that "Integrating the classical book structure (i.e. the familiar concept of a book) with features which can be provided within an electronic environment constitutes a generally accepted definition of an electronic book". EBONI project guidelines also stress 'the legacy of the paper book "metaphor", and the wisdom of adhering to this, where appropriate, in the construction of the electronic book' (Wilson & Landoni cited in Chong, Lim and Ling 2009: 214).

Studies done more than two decades back with the book "metaphor" in the Visual Book experiment dealt with a particular interpretation of the electronic book that draws heavily from the visual features of a real book, such as dimensions, thickness, page format and the overall design style (Landoni 1997). A decade later, almost all of the features and functionalities of the visual book like bookmarking, highlighting, writing on the margins etc. have been integrated into the diverse e-book reading devices available commercially like Kindle, Nook and iPad. iPad's e-book application iBook in its own way tries to follow the 'book "metaphor"' by giving a 3-D book interface for its books instead of normal texts on the screen. The Kindle on the other hand tries to adhere strictly to the print-book reading experience. Both iPad and Kindle apply the book "metaphor" but perhaps with different interpretations of the "metaphor". However, it should be noted that neither Kindle nor iPad treat fiction e-books as a separate entity while applying their individual interpretations of the book "metaphor". There have been a few initiatives to rethink the book "metaphor". A prime example is the introduction of Vook in 2008, an application which integrates written text with video content and social media. Though it was primarily found to be useful for the instructional texts, there has been an active interest in the fiction industry around the new proposition.

This brings the discussion to a stage where I will progress from the focus on the physicality of the medium or the technology to the compatibility of a medium with the content that it tries to project. The designers of media technologies like e-books have often bypassed the reality that consuming fiction can be essentially very different as a process than reading non-fiction. What it means is that a medium or a technology that is efficient and acceptable to the users for reading non-fiction may not necessarily be suitable for fiction. Going into the reasons behind such incompatibilities is not within the scope of this research but acknowledging the incompatibility is vital for the interface designers. This issue of compatibility can be seen both from the point of view of a medium's affordance and also from the point of view of the complexities inherent in people's consumption of media. As I have already discussed the former point of view through the perspective of the medium theory, I will now look at the complexity inherent within the users.

Shifting from the Medium to the Content and Its Consumption

The research and debates around the e-book design or hypothetically around any media interface often suffers from its unidirectional focus on the medium or the technology involved, leaving little room for looking at the complexities in the actual process of the user's consumption for different genres of content. Reading is not generic in its process and complexity. Academic or professional reading involves 'a diverse mix of linear reading, skimming, annotating, interleaving, reading and writing, and switching between documents'(Chen, Guimbretiere & Sellen 2012: 18) and such reading has been defined as 'work related reading'(Adler *et al* cited in Chen *et al* 1998: 18), 'active reading' (Adler & Van Doren cited in Chen*, et al* 1998: 18) or 'responsive reading' (Pugh cited in Chen, *et al* 1998: 18). In contrast to that, reading of fiction is fundamentally different in its nature and purpose. This has been well established by 'reader response' theories and studies based on the theory. Nell's (1988) landmark study on the psychology of reading fiction for pleasure or 'ludic' reading delves into how readers get lost in the process of reading. Nell (1988) concludes that readers of fiction become absorbed into the fiction because processing simple concepts of fiction demands less attention from the readers when compared to reading complex academic or professional texts. The reader of fiction uses the power of vision to register the words on the text, but 'experience the world of the text, in reality through the imagination' (Trochianko 2010: 152). Within the diverse world of narrative fiction, there are significantly different reading processes that a reader may employ depending on the style of the fiction. The ways of interpreting and imagining the fictional world may be different for a non-linear narrative structure when compared to a linear narrative style.

Understanding the implications of reading and the role of the reader underwent a drastic change with the emergence of Reader Response Theory. The Reader Response Theory tries to account for 'what happens when human beings engage in a process they call reading' (Harkin 2005: 411) and was enunciated by a group of texts written by authors like Louise Rosenblatt, David Bleich, Wolfgang Iser, Stanley Fish and Norman Holland. Rosenblatt (cited in Harkin 2005: 411) the original proponent of the theory, makes distinction between reading done for obtaining information (efferent reading) and that done for pleasurable experience (esthetic

reading). She also points out that these different purposes make the reader adopt different reading strategies. Holland (cited in Harkin 2005: 412) 'helps to explain the exuberant multiplicity among individual readings'. Iser's research (cited in Harkin 2005: 412) gave detailed descriptions of the processes 'by which consciousness constructs meaning as readers encounter gaps' and thereby create a consistent meaning of the literary text for themselves. Reader Response Theory for the first time enunciated a transactional nature of the reading process that allowed both kinds of possibilities to coexist. On one side is the belief that 'authors intend something when they write' and the readers try to get that intended meaning through the process of reading (Harkin 2005: 413). There is also the other notion that 'authorial intention is unknowable and that constructed meanings are disparate and contextualised' (Harkin 2005: 413). This is partly because 'literature has always been considered a relative concept' and 'any other concept related to it also possesses the same nature' (Ghandehari 2012: 1383). The process of reading literature is still considered a very complex and 'intangible process', as in spite of certain generic similarities, every individual reader 'experiences this process in a unique manner' depending on 'his age, past experience, knowledge, style of reading, rate of his preciseness,' the 'power for simultaneous analysis and interpretation', the 'ability or disability to read between the lines' and several other subtle factors (Ghandehari 2012: 1383). The idea of unique reading possibilities in literature where a reader can decipher meaning and use his/her own creative imagination in a unique manner is somewhat similar and runs parallel to similar media consumption models for electronic media posited by media researchers like Stuart Hall.

Stuart Hall's (1973) seminal idea on audience reception of televised messages also points out the manner in which the audience reads messages sent to them through electronic media. He disrupted the earlier held belief that the audience interprets a message in the same way as intended by the encoder. His model shows three possible ways in which each audience member can interpret a message differently based on their cultural background, economic standing, and personal experiences. The receiver of a message can take three different positions with regards to the message being conveyed: dominant /hegemonic, negotiated or resistant. In the

dominant/hegemonic reading the audience member interprets it exactly the way the sender intends it to be interpreted. The negotiated reader accepts the intended meaning but also disagrees with certain aspects of it. The resistant reader on the other hand completely rejects the intended meaning of the message even though he/she understands the intended meaning of the message.

Does Hall's model have an implication for interface design? If we connect medium theory which looks at the way the technology of a medium can vary the message that is conveyed to that of Hall's model where the message itself can have different kinds of interpretation, the resultant gives us an indication that an interface design's impact on the audience may not always be as the designer intends it to be and that mismatch is not merely because of reasons related to the technological functionalities of the medium. Apart from the reasons attributable to the medium itself, the same interface or the content projected through the medium may be interpreted in diverse ways depending on the culture, economic standing or personal experiences of the user and the analysis needs to account for these diversities.

Impetus for the Next Stage of Research

So far, the discussion through theories and empirical research has tried to establish the manner in which the technology of the medium, the differences between the types of content projected through a medium and the diversity of the user's frameworks of interpretation play a significant role in the process of remediation or the reception of any new media interface. In a scenario where the future of novels as literary form in the digital era is still 'in the early stages of evolution', and the idea of orality is resurfacing in a media environment vibrant with different attempts in remediation, there is a growing realization that we need to 'free ourselves from trying to adapt the novel with all its attendant strictures and formalities to the screen and focus instead on how to take storytelling into the future' (Welden 2012: 65). Phenomenological immersion of the reader, the kind of immersion that we experience while reading a page-turning novel, is "largely the product of our own mental, cognitive abilities to create that fictive, virtual world from the symbolic representations' which may be purely linguistic or multi-modal, digital or print-displayed by any technological platform" (Mangen 2008: 412). Material supports

like the book-print or digital or any other digital storytelling platform therefore have to be ideally transparent and yet tangible in a way that does not disturb the essential phenomenological immersion and reduce the technological immersion. The digital medium brings forth the unique opportunity to marry the multi-modal advantages of oral storytelling to the individualized immersive reading process for a printed novel. This is precisely the intention or the conceptual idea that provides the impetus to move into the next stage of my research where the discussion will centre on the methodology of designing the digital interface.

Designing any technology interface involves choices to be made about not only about competing concepts but also about the technology to be used from a range of options. Emerging technologies like augmented reality, three dimensional virtual reality, holographic images and olfactory assisted storytelling have opened new opportunities for creating multi-modal digital alternatives that can simulate or create the affordances of an oral storytelling performance. Interactive 3-dimensional simulation has been found to be more effective in achieving immersion of viewers than 2-dimensional images of the same object and achieves a higher sense of immediacy with respect to the actual physical object (Berneburg 2007). Engagement with such realistic multimedia through haptic interaction also has been found to achieve higher levels of immersion and amusement in the study done on broadcast of realistic multimedia (Cha et al 2004). In a work done on the subjective experience of smell in relation to Human Computer Interaction, it has been seen that the addition of an olfactory dimension to the storytelling experience enhances the imagination of the real experience as portrayed through written text or oral delivery (Obrist, Tuch & Hornbaek 2014).

While a plethora of digital technology options as exemplified above are ideally available as choices for me to remediate the oral storyteller onto a digital interface, the path to be chosen for this design-based study will be constrained by several factors that range from financial, situational, time availability and availability of resources that is typical of a doctoral study. It is also guided by the methodological priorities of the study that will be detailed in the next chapter. I will therefore not attempt to detail the specifics on these different options for emerging technologies as the goals of this study are not to unravel the strengths or weaknesses of any

given technology. It is more to use an available opportunity to remediate oral storytelling onto a digital platform within the constrained choices of the University Media Department and build an analytical framework around a remediation exercise through the relevant media studies theories. My assumption is that irrespective of the available digital technology being the most avant-garde to one that is much simpler and common-place, the scope for unpacking the complexity of remediation is not reduced. From my personal experience (as an interface designer), it is almost a norm for interface designers to remain limited to the immediate functional aspects of the technology that they use and the immediate purpose that the design is supposed to fulfill for the users or the client. But the goal in this study is to progress from mere 'designing for a defined purpose' to 'design thinking' that is self-reflective about how that purpose sits within a broader framework of media evolution where both the technology and culture are linked. It is also to explain the user's reception of the interface within that framework of media evolution. I have so far detailed the theoretical postulates and empirical studies around remediation that inform the goals of this study. The next chapter will therefore look into developing the methodology for the rest of the study and the manner in which design thinking is different from the conventional norms of designing. Analysis of the data will thereafter be carried out based on the methodology.

CHAPTER FOUR

Methodology of Design and Analysis

In the earlier chapters, I have drawn from the discourses and theoretical constructs about technology and its linkage to culture, historicity of remediation initiatives involving orality and the flux around the remediation of printed books to e-books as a test case. The purpose was to show how interface design initiatives for remediation are not merely an exercise in using the affordances of an available technology for a neatly defined design purpose. Design thinking suggests a much richer design paradigm. Irrespective of the correct or incorrect choices in a design solution, the basic intention to remediate oral storytelling into a digital interface attains a richer texture when it is informed by the socio-cultural context in which the design purpose exists, the historicity of media technologies and the cultural conventions that have a transactional linkage. The complexities of remediation are therefore not limited merely to the power of the technology.

In the last chapter, I have revealed the intention to build an interface that remediates oral storytelling into a digital interface but in a manner that is different from the contemporary existing forms like audio-books, digital storytelling or podcasts. I have also briefly touched upon the fact that the media cultures of orality, literacy and virtuality (posited by medium theorists) will be used as cultural variables to trace the impact of these cultures on the remediation exercise to be undertaken. However, before detailing the typifying characteristics of these cultures that will be used for analysis, the priority is to lay out the philosophy of design thinking that has prompted the choice of these cultural variables as analytical tools or other choices made about the development of the interface and the analysis thereafter. This is essential to the study as the design philosophy adopted for the study marks a departure from conventional design principles in certain aspects and this has an impact on the methodology of design and analysis to be adopted.

Design: Efforts to define

In the first chapter, I briefly indicated the gaps in the conventional definitions of 'design' and the need to progress to a more refined idea of design thinking. The understanding of the term called 'design' is mired in subjectivity because the process involves creativity and unpredictability (Shneiderman & Plaisant 2010). The need for defining the concept of design as assumed in this research is not merely for those who read this thesis, but more so for my own aim in holding a lens over the haziness about the genesis of design that I have encountered like many other fellow designers in my earlier work. Design for a long time was judged and analysed through the final outcome and was rarely seen through the currently emerging concept of 'design thinking' where it is believed that 'design as design thinking should provide more than mere design' (Kimbell 2011: 286).   Christopher Alexander posited the idea that 'the ultimate object of design is form' (1971: 15). This sounds very close to the informal response from an undergraduate who, being untouched by any formal knowledge in the subject of design, believed that design is about how things look. That design is about 'form' which gives physical arrangement to make things look in a particular way is the dominant generic notion about designers and the purpose of design. Herbert Simon, a contemporary of Alexander however moved away from this dominant view to conclude that design is in the domain of engineering, management or medicine and the commonality that drives these fields is by their aim of 'what ought to be' against the sciences which are concerned about 'what is'. These almost dialectical approaches as espoused by Alexander and Simon created the ground for defining design where one looked at design in all its materiality (Alexander 1971) and the other saw design in the realm of the artificial and abstract (Simon 1969:2) whose aim is to bring about a desired state of affairs. These definitions together give a broad picture of what design is meant to do, either in material or abstract ways. Reading them together, one can see that design has a materiality about it that even a naïve user can easily perceive and beyond the materiality every design also is embedded with an artificiality or abstraction that is palpable to the mind but not to the material senses. While Alexander's definition is limited by its over-reliance on 'form' and ignores other important parameters like function or the abstract aspects of design, Simon's claim that design is exclusively

existent in the domains of the three subject areas of engineering, management and medicine is also rarely accepted by the design disciplines. But ironically it is Simon's stress on the design's 'conception and planning of the artificial' that has emerged as the central commonality that brings together people from diverse academic and professional disciplines under the aegis of design thinking or deliberations (Buchanan 1992). This powerful, all-encompassing criterion will be used repeatedly as I progress in the task of designing the prototype of the interface and chronicling its genesis and impact. What cannot be judged or conceptualised merely through the formal design criteria of 'form' and 'function', can be done through that of the 'creation of the artificial'.

From Design to Design Thinking

However, the propositions about design made by Alexander and Simon both stay limited to the extent of defining the idea of design, but stop short of describing the manner in which it comes about. Much before the concept of 'design thinking' came about, Jones (1970) made an initiation by talking about the process of design and how a problem was conceptualised in a different paradigm in order to come up with a new solution. 'Design thinking' was an outcome of the concerted emerging effort from the diverse fields of architecture, engineering and product design to 'study how designers think', 'what they know as they solve problems', 'how they approach and make sense of their own work and as well as how they actually do it'(Kimbell 2015: 296). The overwhelming majority of the researchers have stressed the *designerly ways of knowing* where designers view problem solving as solution-focused and often manage ill-defined problems by situating them within a broader argument about design. This makes it different as a discipline of study as compared to the sciences and humanities (Cross 1982: 2001: 2008).

Peter Rowe's Design Thinking (1987) was one of the initial attempts to posit 'design thinking' as different from design. Rowe ideates the designer as having an episodic way of dealing with their work, depending on hunches and presuppositions that often go beyond the facts of the problem. In the designerly ways of thinking, the process of solving a design problem often shapes the solution that is unique to a particular designer/s. Designers also show a tendency to treat all problems as ill-defined, irrespective of whether they are ill-defined or not. This also often results in

the tendencies of the designers to resolve problems through abductive reasoning where solutions are not guaranteed by the premises. The process can also be explained through the fact that designers often change their understanding of the problems even as they are trying to find a solution and such solutions often try to connect paradoxes or try to go beyond the paradox (Dorst 2006). Problems and solutions often are also seen to co-evolve (Dorst & Cross 2001) within the context of a multiple set of constraints (Lawson 1997). While design thinking has a large number of characteristics like conditioned inventiveness, human-centred focus, environment-centred concern (to name a few), the most dominant characteristic which is common across all the propositions is that of the problem-constraints-solution nexus.

The problem-constraint-solution trinity of design thinking as discussed above is relevant enough to be applied for the remediation initiative in this study. The implication of this discussion on the methodology of the study is in positing the criticality of defining the problem (or defining the ill-defined nature of the problem) within a set of constraints that face the designer in a given situation. However, it is often the case that there is no defined error or a problem in a given design situation (as in this study) that the designer is aiming to correct. For example, how do we conceptualise a design situation when we are presented with the simple human 'intention' to explore the possibilities for a paradigm shift in the way we listen or read or tell our stories and not a given set of problems to be sorted out through a design solution?

Bill Verplank, the celebrated designer and researcher who along with Bill Moggridge coined the term 'interaction design', suggests something on this line in the four step process of interaction design (2007). The initiation of design according to him can be from either a motivation or an error (2007: 131). Design needs to start either by 'understanding the problems that people are having' and/or also from 'ideals' to make the world a better place as per the subconscious desire of the people or the designer himself/herself (Moggridge 2007: 131). Some designers get motivated by 'a breakdown of one sort or another, errors that they observe' (Moggridge 2007: 131) while some others work from a more complex need that is yet to be expressed as a problem. How does this apply to the context of storytelling and the 'intention' of

building an interface with an oral storytelling platform? Is there actually a problem or error that exists in the arena of storytelling interface design or is it merely a motivation with an ideal to achieve something more than solving a problem?

Media Culture and Design Problems

The earlier chapter discussed the scenario around the consumption of stories through e-books and the emerging preference for orality in the forms of digital storytelling, audio-books and podcasts. The fact that each of these options for story consumption have held on to their own loyal customer base or are growing at different rates is testimony to the fact that there is no glaring error or problem that resides within the concepts of those media interfaces. This also applies to the scenario when the printing press superseded oral storytelling or handwritten manuscripts with printed books. People had not perceived any apparent glaring problem in their story consumption that revolved primarily around the oral culture until the printing press came and exposed people to its potential. More than it being a problem or error it was progress of human civilization into a different epoch of mass literacy and democratization of reading culture. The impact of literacy was much more than Gutenberg could have ever conceived while designing the printing press. Thus the designs of fundamentally different media interfaces are not necessarily borne out of a neatly defined problem or even an ill-defined problem. More often than not, they may be the output of a motivation that evolves out of the socio-cultural realities within which the designer/s live, think and practice their profession. Media choices are therefore ever evolving and can have infinite possibilities within the domain from which they originate and are used as the designers/s and the users individually and collectively have different frameworks of knowledge and cultural background through which the choices are made. This is exactly the reason for the existence of multiple media formats, each standing for different set of cultural values and norms through which they originate and are used. Donning the dual role of the designer and researcher in this study, I will therefore be guided by the 'motivation' or the 'idea' of remediating oral storytelling performances in the digital platform. As I discussed in the last chapter, this apparently subjective intention or motivation arises out of a combination of factors, one of them being my childhood memories of storytelling by my grandmother. The other immediate reason

is the collective media culture in which I thrive has brought orality back into the digital era through remediated forms of audio books or podcasts and this research opportunity provides a platform to explore the possibility of another version of remediating orality. Because the design motivation in this study is not stimulated by a glaring problem/error or a deficiency in the system and can therefore be classified as an 'ill-defined' design problem, there is a need to search for a suitable design philosophy that can provide the theoretical support for such acts of remediation. This will be done through a discussion that explains some of the conventional models of design processes and then progresses to the ideas on design thinking that are more compatible for handling 'ill-defined' design problems. This is relevant for this study as irrespective of the media technology, remediation initiatives are most likely to be ill-defined design problems and it will be a significant contribution to find a theoretical framework that can help interface designers conceptualize such situations. However, linear models irrespective of their lack of flexibility, delineate certain steps that in isolation may inform the design thinking process and therefore need due consideration before moving to more progressive ideas.

Conventional Models for Design

The methodology of design has largely been seen as a linear step by step model until critical voices doubted the universality of the linear model and also questioned its ability to explain design thinking or methodology in diverse areas cutting across engineering, medicine, architecture or the rapidly emerging information technology sector. The linear model has developed multiple variations but on the whole its proponents see the design process as being divided into two distinct phases: problem definition and problem solution. Problem definition according to this linear model is an 'analytic sequence during which the designer determines all of the elements of the problem and specifies all of the requirements that a successful design solution must have' (Buchanan 1992:15). Problem solution 'is a synthetic sequence in which all of the various requirements are combined and balanced against each other, yielding a final plan to be carried into production' (Buchanan 1992:15). This design process has conventionally been found acceptable and attractive by designers and academics as it has a logical precision that can explain the apparently subjective nature of the design process. However, this linear model

through its apparent effort to simplify the process of design thinking misses out on the fact that the sequence of design thinking and design creation rarely follows a simple linear process. It also ignores the fact that the design problems often by their very nature do not 'yield to any linear analysis and synthesis yet proposed' (Buchanan 1992:15). However, linear models still do throw light on some of the essential steps that designers would invariably follow, either in complete or in part, linearly or non-linearly. To illustrate some of the relevant linear models would be therefore useful.

The Bootcamp Bootleg Model is one of the most concise and complete models that is applicable for complex design problems. Though on the surface of it, it is built like a linear model, it allows non-linear flexibility. Each element in the model (see Figure 1) is not necessarily part of a sequential process. The steps do not follow a specific order and can occur simultaneously or can be iterated. In fact 'the stages should be understood as different modes that contribute to a project, rather than sequential steps' (dschool.stanford 2010).
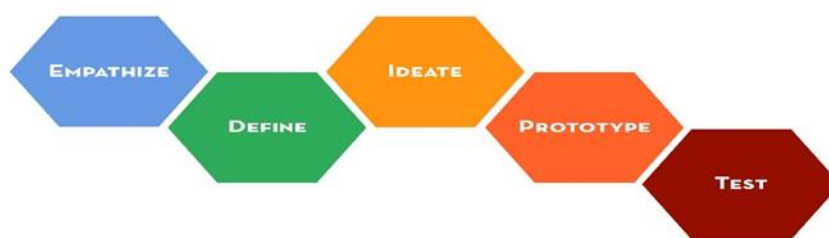
Figure 1: Boot-Camp Boot-leg Model

Source : dschool.stanford(2010)

One of the most important features of this model is its element of 'empathise' which is unlike other linear models that start with problem definition. Empathise is the stage when as a human-centred designer, one would like to understand the people for whom the design is meant and their dreams and visions of the 'better world' or the 'error-filled world'. This is essential for cultural media products more than any shop-floor machine design problem as human problems are far more ill-defined due to the essential subjectivity inherent in human communication and culture. Even before deciding to plunge into the step of 'empathise' as one of the essential steps for designing the technological artifact in this project, I would hypothesise that the

steps of 'empathising', 'defining' and 'ideating' often do happen and should happen simultaneously as the act of defining a problem and ideating the solutions keep happening as we keep empathising with the diverse viewpoints coming from the potential users. But, it's possible that the act of defining may take a concrete shape only after going through a continual process of formulation and reformulation as one keeps making incremental improvement in refining one's ideas of the problem through incremental addition to the body of opinions that the potential users provide. Ideas about potential solutions that are supposed to be part of the stage called 'ideate', are also often likely to emerge seamlessly within the stage of 'empathise', if the designer is personally involved in the process of empathising and defining the problem. Bootcamp-bootleg model of design thinking in fact has a high degree of non-linearity built into it as can be seen from the diagram below. It has several levels of iterations that may be needed before a design is rolled out successfully.
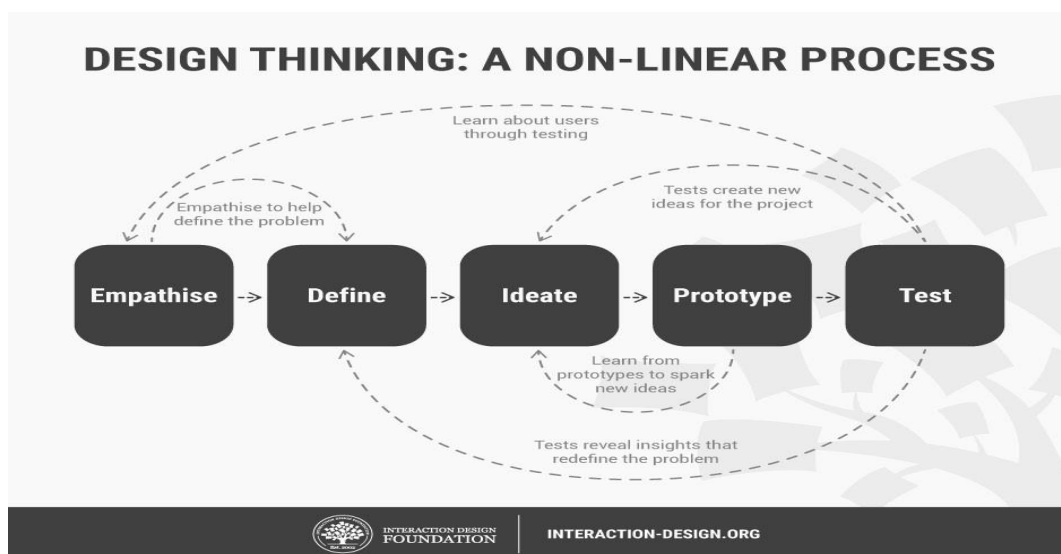
Figure 2: Non-linearity in Boot-Camp Model

Source : dschool.stanford(2010)

The other linear-nonlinear combination of design thinking was proposed by Simon Herbert in his seminal work '*The Science of the Artificial*' (1996). His concept of design divides the process into seven stages: define, research, ideate, prototype, choose, implement, and learn. These stages also can happen in both linear and

non-linear fashion. The limitation of his design thinking however is the fact that he looks at design as the domain of engineering, medicine and management and therefore his process oriented approach may often not be compatible to design as applied to media. For example, Simon's design thinking process starts with 'define' which is a typical characteristic of design situations in the field of engineering, medicine or management where the process of design cannot be initiated without the design problem being 'defined' in a precise manner. But as I have pointed out earlier, design situations in media may often not be initiated through a strict 'definition' of the problem.

The above two are just the examples of the scores of design processes that have been proposed and used by diverse researchers and practitioners of design. Enlisting and describing other such design methodologies would not add to argumentation for finding a desired methodology for this project as they are essentially variants of the above two methodologies with differing numbers of steps. Some of them are absolutely tailor made for industrial design aimed at solving a purely technical problem. They are therefore not compatible to the complexity of designing media products which often have ill-defined problems and sometimes may even be typified by the lack of a perceived problem by the potential users. The complexity of designing an interface that brings oral storytelling performance into a digital interface is not in designing the interface in order to solve a defined problem that users are facing with e-book readers, audio books or any of the other media formats for story consumption. But it is in designing with the purpose of exploring the nuances of media cultures that impact or constrain the creation and consumption of a new media interface. As discussed earlier, this potential scope of creation and consumption is not merely defined or constrained by the nature of the interface technology, but subtle cultural problems that arise when any media technology is remediated. We have seen such complexities of remediation for every other media format when it emerges out of the womb of an existing media format. It took a significant time for printing technology to figure out the manner in which the new technology would transform the hand written manuscripts or oral storytelling into the printed book format. So were the cases with progression from theatrical

performances to movies, books to e-books and many other such acts of remediation.

Therefore, in a nut-shell the design situation for this study is not about solving a specific interface design problem or a functional inadequacy but more so about exploring the possibility of a new media paradigm. It is also to discover the subtle or direct ways in which the new paradigm owes its genetic make-up to pre-existing media cultures like orality, literacy and the emerging culture of virtuality. This mandates one to look for methodological approaches that go beyond the *define-design-prototype-test* mode of industrial design thinking. Even if we accept the fact that the stages of 'empathize', 'define' and 'ideate' are essential steps that may need to be adapted in some form for the design process in this project, there is a core question that needs to be addressed. In absence of a defined goal or a structured design problem, what purpose would drive the three stages as mentioned? How would the prototype be evaluated through testing in absence of a clear functional problem driving the solution? Does this design effort fit into an overarching goal that is bigger than this design output or it is an end in itself? These questions are not merely the questions that are specific to this design project but have been raised in design thinking theorizing whenever cross-disciplinary design issues have come up that went beyond the disciplines of engineering, medicine or management and spilled over into areas of media and humanities. John Buchanan responded to such questions within the design discipline with his 'wicked problems' approach.

Design Thinking: The Wicked Problems Approach

Lack of defined problems in designing media interfaces can theoretically be addressed through John Buchanan's 'wicked problems' approach as laid out in his seminal paper '*Wicked Problems in Design'*(1992). Buchanan shifted design theory away from its legacy in craft and industrial production towards a more generalized "design thinking". Buchanan draws the inspiration from the pragmatist philosopher John Dewey and puts forth the idea that design falls in the arena of liberal arts that can be suitable both for the needs of the technology and also of human social problems. Buchanan builds on the original idea of Horst Rittel, who in the 1960s tried to find an alternative to the linear or step-by-step model of the design problems

and came out with the concept of design problems being 'wicked' (Rittel & Webber 1973). Rittel's original proposition argued that certain design problems addressed by designers fall in the category of 'wicked problems' which was broadly defined as a class of social systems problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications of the whole system are totally confusing. Rittel laid down ten defining characteristics of 'wicked problems' (which I will discuss later) and these characteristics not only form the foundation for the design methodology (in this study) that I am trying to lay out but also will serve as a framework for analysis in the final stages of the dissertation. If we place this definition of 'wicked problems' as proposed by Rittel against the backdrop of new media formats or the intention to remediate oral storytelling, the connection seems quite appropriate as any effort to remediate is likely to be a 'wicked problem' where the goal is ill-formulated, ramifications are yet to be ascertained, and the potential users may have divergent values and gratifications. The truth in this assumption that I am making will be borne out by the results of the study where specific connections will be made between the conclusions and the characteristics of a wicked problem as laid down by Rittel.

In the linear models or the normal process driven models of design thinking, designers work on the assumption of determinate problems with definite boundaries and the task of the designer is to identify these conditions precisely and then calculate a solution. However, in contrast to that, 'wicked problems' approach of design thinking takes the position that every design problem, with a few exceptions, is essentially indeterminate. The ones which become determinate or mere analytic problems have their wickedness taken out of them through detailed product specifications from the client. The 'indeterminacy' of media design problems have to be understood in the context that it is different from 'undetermined' in the way that design problems mostly have no 'definitive conditions or limits'. The idea of indeterminacy in design problems holds true for media technology design at a broader level as no new media is designed at the start with a definite goal to be the end-point or with a perfect understanding of the user's media needs. Rittel & Webber's (1973:161-167) ten properties for wicked problems will prove useful in the

context of this study as these criteria act as an analytical lens for looking at the remediation design problem/and user reception from a broader perspective than the bordered perspective of linear design models. They also act as a check-list that helps interface designers differentiate between the nature of an industrial design problem and the one in the area of media.

(1) There is no definitive formulation of a wicked problem.

2) Wicked problems have no stopping rules.

3) Solutions to wicked problems cannot be true or false, only good or bad.

(4) Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions.

(5) For every wicked problem there is always more than one possible explanation, with explanations depending on the Weltanschauung[1] of the designer

(6) Every wicked problem is a symptom of another, "higher level," problem.

(7) No formulation and solution of a wicked problem has a definitive test.

(8) Solving a wicked problem is a "one shot" operation, with no room for trial and error.

(9) Every wicked problem is unique.

(10) The wicked problem solver has no right to be wrong-they are fully responsible for their actions

Instead of explaining and elaborating on each of these properties as listed above, I will summarise the interpretation of Rittel's listed properties that have implications for this research through relevant examples. Rittel's tenets fundamentally rest on the distinction that he makes between an 'indetermined' and 'undetermined' design problem. According to him, undetermined problems are design situations where a designer is asked to solve a defined analytical problem, and the success or failure of the design is measured against that. A typical example would be to design a lawn

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[1] World view or Philosophy

mower that reduces the incidence of lawn mowing injuries to a definite percentage. Indeterminate design problems on the other hand have no limiting boundaries or goals to achieve, which when achieved will result in a final solution to the design problem. My earlier discussion on e-books is a typical example of such a problem where a designer of any e-book version in the end designs according to his or her own world view (termed as *Weltanschauung of the designer*) about story consumption or how an e-book should be for the reader. There are also no definite ways of judging the success of an e-book design when the reader is culturally biased towards reading from a printed book. The problem does not have any exhaustive list of possible solutions with defined stopping rules for further design initiatives because storytelling and story consumption is a cultural practice that is not uni-dimensional in the way it is practised by different people at different points of time. The design problem cannot be given to the designer as 'a definitive formulation' and depends on what the designer perceives the problem to be. No version of e-books can count as a 'true' or a 'false' solution, but can only be dubbed as 'good' or 'bad' within the overarching wicked problem of how people want to read stories in the digital age. Last but not the least, a given design for an e-book is a 'one shot operation' as once it has been used by the reader, it cannot be taken back to overturn the consequences of the design. The effect of the reading experience stays lingers with the readers long after the reading process has been completed and cannot be overturned by offering another design. A new design can offer a different reading experience but the effect of the earlier experience will have an impact on the future reading experience in subtle ways that cannot be overruled. One can perceive through the brief application of the 'wicked problem' concept on e-books design, that almost all media innovations with socio-cultural implications have similar features inherent in their design problem.

Buchanan accepts Rittel's properties of wicked problem as a starting point but adds to that by elaborating on the basic reason behind design problems being 'wicked'. The properties of wicked problems (as posited by Rittel) along with Buchanan's rationale behind their wickedness combine to provide the philosophical foundation for explaining the methodology that I will follow for the interface design in this project. Buchanan's approach is essential for media interface design because

design problems in emerging media technologies often would not or rather should not fall into the trap of being seen as a functional technology problem waiting to be resolved and made determinate.

Without wanting to sound accusatory about e-book designers, I will assert that unlike a production shop-floor design problem, the problems in media consumption are typified by their 'wickedness' as they are essentially 'indeterminate' and 'fluid' in nature and therefore methodologies could also become 'wicked' in their own rights. Buchanan makes this amply clear when he argues as to why the design problems are indeterminate and therefore wicked. According to him, 'the answer to the question lies in something rarely considered: the peculiar subject matter of design' and the wickedness arises out of the fact that 'design has no special subject matter of its own apart from what the designer conceives it to be'(1992:16). The methodology of the designer cannot be box-fitted as in applying design skills, the designer 'must discover or invent a particular subject out of the problems and issues of specific circumstances' (Buchanan 1992:16). This is unlike the sciences where one is concerned with 'understanding the principles, laws, rules or structures that are necessarily embodied in existing subject matters' and investigating certain undetermined or under-determined issues to make them fully determinate.

Buchanan's wicked problem approach posits that the designer methodology is essentially about initiating with a quasi-subject matter, 'tenuously existing within the problems' (1992: 17) and specific circumstances. A quasi-subject matter according to him is not an 'undetermined subject waiting to be made determinate' but rather it is an indeterminate subject waiting to be made more specific and concrete' (1992: 17). This sits well with the social constructivist stance that inspires this study because social constructivists from a different perspective talk about how technology evolves out of the socio-cultural flux due to certain presumptive choices made by the relevant social actors and is not just a matter of creative construction by an individual designer. The designer's job is to reflect on the flux or the wickedness in the situation and give shape to a design problem and provide a solution according to his or her own world view. This is with the realization that the definition of the design problem is only one of the many possible definitions and the solution is a reflection of the assumptions of the designer. The client's brief for a

media design application therefore does not present the subject matter of the design. It only presents a problem and a set of issues that the designer needs to consider while solving the problem. The designer is meant to transform these problems into a working hypothesis about the features of the product. In other words, it is the designer's job to take the wickedness out of a given problem through his or her working hypothesis. But it does happen many times that an activist client or the manager in charge briefs the designer with the possible features of the product in great detail and thereby attempts to take the 'wickedness' out of the design problem even before the designer attempts to do that.

Wicked Problems in acts of Remediation

As this research involves an act of remediation with the intention to remediate oral storytelling performances onto a digital interface, a brief look at how wicked problems apply to acts of remediation may be useful. Continuing with the earlier example of e-books, interface designers in their efforts to come closer to printed books have kept on adding an increasing number of technological functionalities hoping to solve more and more determinate problems in the reader's need for reading stories. However, these added functionalities have so often been viewed as 'food pills instead of the actual food' or as 'technological immersion' at the cost of the 'phenomenological immersion' (Mangen 2008) needed by the readers of a novel. This in my view was the designer's attempt to make the design process seem logical, determinate (therefore lacking wickedness) and provide a 'methodological precision that is independent from the perspective of the individual designer' (Buchanan 1992: 17). Buchanan would probably argue that the e-book design problem has historically been treated in the same manner as in sciences where an undetermined subject waits to be made determinate instead of aiming to break out from the bubble of mimicking the earlier media culture. The wickedness in the e-book design problem could have been seen as the desire for the emerging digital culture to get an alternative form of reading culture that breaks out from the 'book metaphor'. This is a different design goal from that of exporting books onto a digital reader. But applying the ideas of medium theory and the theory of remediation, it can be seen that mimicking earlier media cultures or appropriating their features has been an integral part of remediation. In keeping with McLuhan's (1967) metaphorical

expression of the 'rear view mirror', this has been observed for every new media (radio, Television, Movies or e-books). This can be seen sometimes as the conscious or sub-conscious act of the designer who is immersed within the pre-existing media cultures to base their work on these established cultures before charting a new course. Therefore, even while accepting the argument that the initial attempts of e-book designers who mimicked the printed books reflect the typical characteristic of remediation in its early days, historical precedents show that remediation works on the principle of progressive levels of wicked problems that are shaped by socio-cultural adaptation to the initial version. As indicated in the earlier discussions on the debates around e-book design based on the 'book metaphor', breaking out from the paradigm of the earlier culture of printed books to a digital culture needed a broader understanding of the wickedness in the problem of e-book design.

To explain it better, we can take the example of the first printed book through movable metal types produced by Gutenberg. The wickedness of the problem arising out the socio-cultural realities was in democratising the availability of written texts. This immediate design problem for him in the initial stage was in designing a technology that makes it possible for written texts to be mass printed and yet be as aesthetically and functionally acceptable as manuscripts or books printed from engraved wood blocks. His methodology was focussed towards grappling with the wicked problems of fonts, line spacing, page dimensions and the overall output of a book that will be consistent in its design within the book and also across all other books of the same title and edition. The design problem was wicked (going by Rittel and Buchannan's propositions stated earlier) as there was neither any precedence to set a benchmark for being right or wrong nor any stopping rules for the design process. As posited by Buchanan, the subject matter of the design was indeterminate and left to Guttenberg (the designer) to define in his own way and his definition of the problem was shaped by the multiple stakeholders with multiple perspectives.

In congruence with the theory of remediation, Gutenberg's first printed book (the Bible), took the handwritten manuscript as a model (Lupton 2010). 'Emulating the dark dense handwriting known as "blackletter", he reproduced its erratic texture by

creating variations of each letter' (Lupton 2010: 13). The content for initial printed books also came mostly from those of oral traditions or manuscripts existing before the print technology came into being. However, as soon as the printing technology started settling down as a production mechanism, the wicked problem of book design emerged at a higher level and designers experimented with new forms of typography and content. While the eighteenth century typography was limited to the reproduction of the different handwriting styles, the onset of mass industrialization and advertising industry set the designers like Giambattista Bodoni and Firmin Ditton to design typography that was very different from the conventional handwriting styles (Lupton 2010). The content for the books also evolved to new forms of storytelling like novels, short stories, comics. Thus, the point that I am trying to put forth through the example of printed books is what Rittel mentions as one of the definitive characteristics of 'wicked problems' of design: "every wicked problem is a symptom of another "higher level" problem'.

The path of interface design for bringing oral storytelling into a digital interface is therefore most likely to be several layers of 'wicked problems' of design, the solution of one leading to the emergence of another higher level problem. The intention of remediating oral storytelling performances into digital interfaces will essentially also be a wicked problem of interface design as the subject is 'indeterminate' in nature precisely because there is no defined problem of interface design that is pre-existing and necessitating a determinate solution. This becomes more so in the absence of any client brief that is looking forward to certain definite product attributes that have to be designed within this subject. The problem has a subjective existence only because as the designer I perceive the potential of this 'artificial' form to be created as opposed to the 'natural' oral storytelling performances that have existed so far. Therefore, guided broadly by the philosophy of 'wicked problems' approach, the methodology for this project will be pivoted on a series of fundamental questions that draw from the earlier discussions on the characteristic features of wicked problems.

How 'wicked' is this design problem?

Progressing from the assumption that the proposed act of remediation for oral storytelling has 'wickedness' involved in it, the next strand of argument that needs

to be teased out in order to lay out the methodology for the study is to ask: What constitutes the wickedness in the indeterminate problem? How do we create a working hypothesis that attempts to extract the wickedness out of the given problem? In trying to answer these questions, I would reiterate the argument put forward by Buchanan (1992) in that the wickedness of a design problem resides partly in the way the subject of design is conceived by the designer. I will attempt to take that argument a step forward and say that the 'wickedness' of the problem not only resides in the conceptualization of the subject by the designer but also in the wickedness arising out of the potential user's imagination and expectations. At the end of the day, the designer is also a part of the collective consciousness or culture in which the potential users exist and their aspirations, limitations and imagination of the 'artificial' colour the designer's conceptualization of the working hypothesis. The ever expanding number of media forms and their variants are symbolic of the 'wickedness' of the human mind in exploring new vistas of communication within the affordances of the human senses and the diversity of human expectations stimulated by the ever-evolving fulcrums of society, culture, pre-existing technologies and the economy. This is congruent with my arguments made in the earlier chapters based on the social constructivist positions of technology development where a technological artifact's genesis is dependent on factors other than the mere ingenuity of the designer. Using the social constructivist stance, I would therefore posit that the potential users can also serve to add to the wickedness of the design problem in the same way as Buchannan suggests that an enthusiastic client can suck out the 'wickedness' of a design problem by becoming more specific in laying out the details of the expected product functionalities. At this point of discussion, what I have in front of me as a designer is the quasi-subject that reads as the intention of 'remediating oral storytelling performances into digital interfaces'. The quasi-subject is indeterminate as the solution has infinite possibilities given the landscape of technology choices to build the interface and also the diversity of gratifications that story consumers seek from such interfaces. Laying out the background for the design problem involves the 'technological landscape' and also the 'socio-cultural landscape' for consumption of stories through media. The technological landscape for media is rife with possibilities that

range from the traditional WIMP items like mouse, keyboards, windows, menus and icons to the non-traditional new devices like eye-trackers, 3-D pointing devices, whole-hand devices allowing gesture inputs, stereoscopic projection displays, head-mounted displays, spatial audio systems and haptic devices. Holographic laser displays and augmented reality technologies have also taken giant strides in offering new media alternatives. The reality of these new media technologies is that 'although we live and act in a 3D world, the physical world contains many more cues for understanding and constraints and affordances that cannot currently be represented accurately in a computer simulation' (Bowman *et al* 2001: 96). Even though computer simulation has advanced remarkably in the span of the last fifteen years, connecting the real-world assumptions with those of the virtual world remains a crucial area of discomfort. This is a generic problem that interface designers are grappling with (consciously or unconsciously) and this is precisely one of the major constituents of the 'wickedness' in designing an interface for remediating oral storytelling performance onto a digital interface.

It would be misinterpretation of the situation if we see this problem as a mere technological wickedness in the design problem or a lacunae in the new media digital technologies. Every new media technology not only is a shift in modality, it is a paradigm shift that causes human beings to think differently (Ong 1982/2002). Thinking differently to use a new media is an evolutionary process of both the human mind and the basic technology which act against each other in a myriad ways before they reach a degree of stability. This is evident from the fact that the progress of media cultures from oral culture to a mixture of orality and literacy, to primary literacy and then onwards to literacy mediated by technology has taken centuries to evolve (Ong 1982/2002). In the process of this evolution of a media, both the media technology and the form of the media content keeps evolving in order to find a better level of compatibility with the audience. This flux in remediation is a function of the characteristics of the pre-existing and contemporary media cultures that are always jostling with the new media concepts to find that 'sweet spot' for the media consumer. So what does that mean for defining the methodology of this study?

Using Cultural Variables to Conceptualize the Wickedness

I have worked my way through a number of models and theoretical underpinnings related to design methodologies and then reached this point of discussion where I would argue that every step in the design methodology for any new media technology interface is directly or indirectly influenced by the features of the pre-existing and contemporary media cultures. If we move back in time in order to buttress this line of argument, we can appreciate the position enunciated by earlier researchers like (Ong 1982/2002, McLuhan 1962/2011) that the medieval period laid the cultural foundation through the advances in writing and manuscript culture that finally culminated in the evolution of print technology mediated literacy. Similarly we can see the hidden strands of orality, literacy and technology mediated literacy culture in the media of movies, radio or television. However 'the shift in using electronic modes of communication was fundamentally different than those reflected through oral and literacy cultures' (Dempsey 2014: 11) and Ong defined it as 'secondary orality' (1982/2002). Contemporary digital media culture 'now finds itself in a similar place to literacy during its infancy, in the same way that orality cultures matured into ones more focused on literacy as a result of the influences of reading, writing and text' (Dempsey 2014: 3). It is in the phase of transition when it is maturing into a culture of 'virtuality' that has its own unique characteristics (to be detailed in the next chapter) and yet the contemporary culture's DNA is not devoid of the pre-existing cultures of orality, secondary orality, literacy or literacy mediated by technology. In fact, the pre-existing media cultures are very much part of the 'virtuality' culture's DNA and are reflected in the manner in which the media interfaces are created and used, the designer and the user both affected by these pre-existing cultures as they progress in this path of transition. However, this is not a conscious realization with which the designers and users make their decisions and choices, as cultural effects on human actions and decisions are subtle and involuntary and function much like the involuntary muscles of our body. The subtle presence of these pre-existing and contemporary media cultures like orality, literacy and virtuality need to be teased out from our thoughts, choices and actions and that is the single most important element of my methodology that would make it distinct from the other design process models that we have discussed earlier.

While the essential design activities that are embodied through the steps like 'empathise', 'define', 'ideate' or 'prototype' (as seen in the different Design methodology models) will undeniably be there in some form as part of the complete process of development, the assumption for my study is that each of these activities will be affected and impacted by the different media cultures (both pre-existing, contemporary and emerging). Therefore, the wickedness of this design problem is not in the subject of designing a new media technology or a media interface with innovative functionalities where 'form' and 'function' of the artifact dominate the designer's priorities. The wickedness of this design project is in exploring the manner in which a concoction of media cultures (past, present and emerging) jostle together when creating an oral storytelling performance in a digital interface. To make it more pointed, this 'jostling together' of diverse media cultures is not an extraneous phenomenon, but it is very much within the thoughts, choices and expressions of both the users and designers. The consistent effort from me as the researcher through the different stages of this design activity will therefore be to capture these range of thoughts, choices and expressions residing within our opinions, choices and media consumption patterns. It may essentially be the same as the step or mode of 'empathising', 'understanding' or 'observation' as discussed earlier wherein designers try to get into the shoes of the users and frame the depth of the problem. However, in this project, in the absence of any definite problem that I am seeking to solve, these stages or modes are not to empathise or understand the user's problem and needs with respect to a definite problem in their daily life. It is rather to give an embodiment to the wickedness involved in exploring a new media culture, the possibility of remediating oral storytelling performances in a digital interface. So the methodological steps from the beginning of the design process to the end will therefore be essentially geared towards answering some of the indeterminate 'wicked' questions in remediation as given below.

The Wicked Research **Questions**

Remediating oral storytelling onto a digital interface is a wicked design problem with no definitive formulation and no defined design purpose in terms of functionalities. I will be guided by some overarching questions that will frame the boundaries for the

research. In the process of interface development and subsequent analysis, I will refer frequently to oral storytelling, printed books, e-books and audio books that form part of our oral, literate and virtual media cultures. Though there are other popular storytelling media like movies, television or even comic books, I will exclude them in the discourse for this study on the assumption that they form part of visual and graphic representation of stories in comparison to forms like novels in books or e-books where the visual representation of a story is created mostly by the reader/listener's personal imagination. The concepts of orality, literacy and virtuality as posited by medium theorists alongside the social-constructivist approach of analysing the development of technology, and media theories on the process of remediation will be used as conceptual tools for exploring the research questions around the interface design.

1. How do the emerging digital technologies co-opt the pre-existing cultures of orality and literacy and what constraints do we face in this evolving process of co-option?

2. How does the emerging media culture of 'virtuality' relate to the reception of new media technology interfaces?

3. What role does the materiality of a technology interface play in shaping the reception of the technology by users who in turn have pre-existing cultural frameworks for interpreting the materiality of media interfaces?

At the very start of the dissertation drawing from a scenario in the film iRobot, I stated that the motivation behind the study is guided by the overarching research question about the contributory factors that shape a technology interface and subsequently the usage of the technology. It is expected that answering these three research questions (as stated above) through the interface development and user trial will indirectly throw light on some of the contributory factors that can impact the evolution of new media technologies through the process of remediation.

The Design Thinking process

The steps or modes that will be followed in a loose, non-linear fashion have been based on some of the established models of design thinking as described earlier.

However, they will be redefined for this project because of the peculiarity that is unique to this project.

Explore:

This is the stage where I will carry out focus groups and questionnaire surveys with participants drawn from University undergraduate students aiming to explore the cultural undercurrents around storytelling media interfaces and potential possibilities of remediation. The exploration will not be to probe the participants for solving a specific design problem of a desired product. This stage is similar to what has been defined as 'empathise' in the bootcamp-bootleg model. Though functionally the stage would be the same as that intended through the human-centred or user-centred design, I prefer the use of the term 'explore' because in this project this stage is more about exploration (both for me and the participants) than empathizing with people's needs and preferences. Other similar design thinking models may have different nomenclature for the same mode. But irrespective of the nomenclature, this stage is basically meant to be the corner-stone for user-centred or human-centred approach to design thinking where to create innovations that have a good fit with the user's expectations and norms, designers are expected to shift their focus from asking about products that they use, to those people's behaviours, activities, needs and motivations (Kumar & Whitney 2007). Empathy has been noted as an essential attribute of qualitative research approaches for successful design thinking by IDEO (cited in Moggridge 2007), Rowland (cited in Hagen, Robertson & Gravina 2007: 12), Suri & Howard (2006: 250) and Visser, Strappers & Lugt (2005).

Analyse:

Analysis is the stage or mode in which I will start unpacking the data collected from the earlier stage. The process of unpacking will use frameworks that delineate the cultural features of 'orality', 'literacy', secondary orality' as defined by Ong (1982/2002) and the expansion of those ideas to define the characteristics of the 'virtual culture' by Dempsey (2014). These characteristics will be used to tease out excerpts that can be mapped against the typifying characteristics of oral, literate and virtual cultures. The data will also be used as supportive material for the final level of analysis and conclusions from the study.

Prototype:

In this study, unlike in commercial interface development projects, the prototype will not be a direct outcome of the focus group and survey results. While the focus group and survey may provide useful creative inputs about possible prototypes that can be developed, the choice of the interface to be built will be largely dependent on what is possible within the constraints of the University. Irrespective of the final choice of technology and interface to be developed, the data generated from the earlier two stages will be useful for teasing out the cultural undercurrents existing within the potential users and analysing the output from the prototype.

It is to be noted that the prototype interface is more with the purpose of exposing the 'wickedness' of a remediation design problem and how media cultures of past and present impact the development and the consumption of the new interface. Unlike commercial design projects, the building of the prototype will therefore not be aiming at creating functionalities that are necessary for easy marketability of the product. The primary aim is more academic: it aims at the unravelling of new knowledge (Bruseberg & McDonagh-Philp 2001) in the field of designing remediation and so the functionalities of the interface will be geared to that aim.

The prototype will be developed within the infrastructural and technological constraints of the University of South Australia's IT lab and with the help of two multimedia software coders. While the conceptual design for the interface will be provided by me, coding will be done by undergraduate students as part of their course requirements under the supervision of the relevant faculty member.

Test

Testing of early prototypes of computer interfaces should ideally involve using representative users attempting to do representative tasks in representative environments (Lewis 2006). Usability testing should also include testing of hypotheses, control groups, and a statistically significant number of participants to deliver statistically significant conclusions or qualitative knowledge that is substantial. However, not all usability testing is conducted in the same manner (Rubin & Chandell 2008) as usability testing can have different objectives depending on the nature of the project (Lazar et al 2012). Usability testing conducted for

industry or commercial purposes has the goal of churning out successful products with minimum use of resources and time. The sole purpose in the industrial approach is that of improving User Interfaces, unlike academic research, for example in this study, where the aim is to expand our understanding of the process of remediation in a particular context. The success of the prototype interface will be measured in terms of *revealing* the 'wickedness' of a media design scenario rather than the normal practice of *solving* the 'wickedness'. Therefore the methodology for usability testing in this project will not follow the idea of practicality (as normally done in commercial projects) but will follow the need for answering certain theoretical questions and testing of the hypothesis. Lazar, Feng & Hochheiser (2012: 267) make this distinction clear when they differentiate *usability testing* where the aim is to find and fix flaws in a specific interface with no goal of generalization, from the *classical research* (such as this study) where the objective is to isolate and understand specific phenomena, with the goal of generalization to other problems.

Data Collection Techniques

Different types of qualitative and quantitative techniques will be adopted for the different stages of the design process. The choices of techniques will be guided by the peculiarity of this project, research guidelines from earlier academic researchers on similar areas and also the infrastructural, logistical and financial constraints as faced by a doctoral student.

A qualitative approach will be dominant in the initial stage to 'explore' where it is essential to reveal the cultural elements that influence or impact any act of remediation. A qualitative approach has been found to be appropriate because in this study 'the problem is framed to understand a phenomenon, and how experience is created and given meaning by the participants' (Khambete & Athavankar 2010:12). It is more about understanding the expectations about storytelling in the digital age, the elements of oral storytelling that are relevant for those expectations, how people want to use the digital technology of storytelling in their daily lives and 'how they think about it and how they feel about it' (Cairns & Cox 2008). IDEO gives us an idea of how the qualitative research method fits into the design thinking process:

Qualitative research methods enable the design team to develop deep empathy for people they are designing for, to question assumptions, and to inspire new solutions. At the early stages of the process, research is generative – used to inspire imagination and inform intuition about new opportunities and ideas. In later phases, these methods can be evaluative–used to learn quickly about people's response to ideas and proposed solutions (cited in Moggridge 2009: 20)

Several qualitative techniques ranging from the traditional ones such as focus groups, interviewing, ethnographic studies and surveys to the more contextually-focused observational methods are being used for user studies in interaction design. While the traditional methods are 'useful at exposing the explicit knowledge of research participants, contextually-focused observational methods help to expose the tacit knowledge (Visser, Stappers & Lugt (2005: 4).
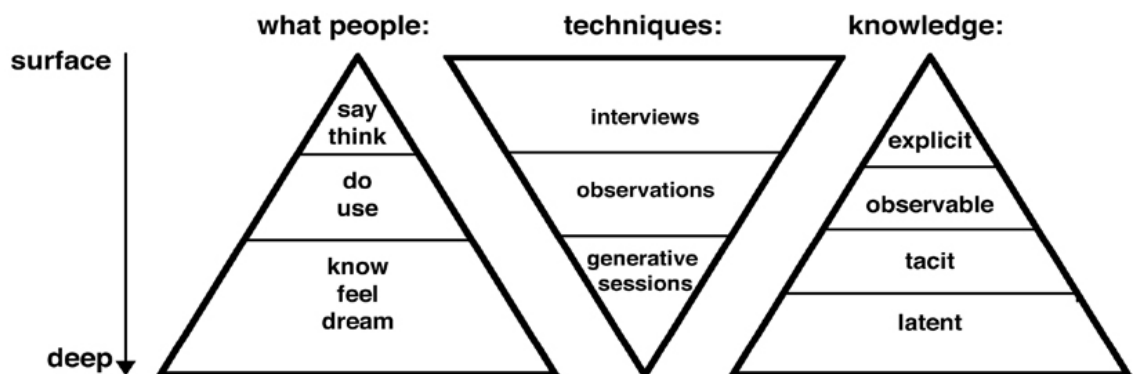
Figure 3: the different levels of knowledge about experience are accessed by different techniques.

Source: Visser, Stappers & Lugt (2005: 4)

However, quantitative techniques like questionnaire surveys (with closed questions) or eye-tracking technologies will be used along with qualitative techniques to add depth to the qualitative data wherever needed and also to improve the quality of analysis. It has been argued by those who combine both the methods that 'quantitative research provides an account of structures in social life but qualitative research provides sense of process' (Bryman 2006:101). Combining both qualitative and quantitative techniques has become increasingly common and known as multi-methods (Brannen, 1992), multi-strategy (Bryman, 2004), mixed methods (Creswell

2003; Tashakkori and Teddlie, 2003), or mixed methodology (Tashakkori and Teddlie, 1998) research. The applied fields like interaction design or human computer interaction have strongly supported this combinatorial approach (Tashakkori and Teddlie, 2003). While there are no strict guidelines about 'how, when and why different research methods might be combined' (Bryman, 1988: 155), the five justifications listed by Greene et al. (1989) in the context of evaluation research are relevant for this study where the quantifiable variables like media consumption, gratifications and choices go hand in glove with the qualitative variables like media cultures of orality, literacy or virtuality. This would therefore need a mixed strategy as and when relevant for the following five reasons listed by Greene (1989).

1. Triangulation: convergence, corroboration, correspondence or results from different methods. This serves the purpose of observing a phenomenon from diverse perspectives' (Bruseberg & McDonagh-Philp 2001)

2. Complementarity: 'seeks elaboration, enhancement, illustration, clarification of the results from one method with the results from another'

3. Development: 'seeks to use the results from one method to help develop or inform the other method, where development is broadly construed to include sampling and implementation, as well as measurement decisions'.

4. Initiation: 'seeks the discovery of paradox and contradiction, new perspectives of [sic] frameworks, the recasting of questions or results from one method with questions or results from the other method'.

5. Expansion: 'seeks to extend the breadth and range of enquiry by using different methods for different inquiry components' (Greene *et al* 1989: 259).

The Methodological Tools

A brief explanation for each of the qualitative and quantitative techniques to be used along with their relevance to this study

Focus Groups: A focus group brings together a range of stakeholders in a discussion group format and as a method it is useful for eliciting requirements and also help to identify issues that need to be tackled (Maguire 2001). The uniqueness

of focus groups is that participants cross-stimulate ideas amongst the other participants , and through the process of discussion, both the individual views and the collective view is framed and often the collective view is greater than the individual parts (Bruseberg & McDonagh-Philp 2001) However, focus groups may not be appropriate for evaluation of a prototype (Nielsen, 2000a). Because storytelling and story consumption is a universal form of human communication that is both individual and collective in nature, focus group will serve as a preferred method for the initial stage of 'Exploring' in order to probe the links between media culture and evolution of digital interfaces. The rich cultural data from the focus groups will be complemented by the quantitative data from the questionnaire survey.

Surveys: are the most commonly used research methods across different fields including media and human-computer interaction. Surveys 'can help determine the needs of users', current practices and 'attitudes to a new system' through a mixture of closed questions with fixed responses and open questions with freedom to write as per their wish (Maguire & Bevan 2002: 5). This method in the field of Human computer interaction or interface design is extremely useful to obtain fast, quantifiable responses from a large number of users about the usage patterns and practices of the current system. They serve to 'capture the big picture relatively quickly, of how individuals are interacting with a certain technology, what problems they are facing, and what actions they are taking' (Lazar et al 2012: 105). Apart from being used in this study along with the focus groups for the mode of 'exploration', questionnaire surveys would also be used at a later stage for prototype testing of the storytelling interface because they are more suitable are also more valid and suitable for evaluation. 'Questionnaires are more formalised than group discussion and can offer an efficient way of data extraction' at the stage of interface testing as they 'provide a standard set of data that can be used for direct comparison between participants and to summarize results' (Bruseberg & McDonagh-Philp 2001: 440).

Observational techniques have been inspired or derived from anthropology and ethnographic research methods and have the aim of putting the researcher in the participant's natural setting and context which reduces the chances of the participant becoming conscious of their own behaviour (Weber 2009: 15). One of the methods employed within observational technique is to keep Diaries, both by the

researcher and the participants. Personal diaries of experiences while engaged in a given activity reveal a lot of the person's own mental models that traditional methods won't reveal. Mobile technologies offer exciting opportunities such as mobile diaries which help 'contextual inquiry' and provide 'rich and deep insights into people's daily rhythms, thoughts and experiences' (Hagen, Robertson & Gravina 2007). Social media technologies are also providing richer opportunities to remove hidden assumptions and biases that might remain unexpressed through traditional methods (BusinessWeek 2006, Gabrieli & Zoels 2003, Hagen, Robertson & Gravina 2007, Kumar 2009, Sato 2009, Visser, Stappers & Lugt 2005, Weber 2009). These techniques of observation are generally applied to observing the users and using the data for an enhanced sense of empathy with the potential users. Ideally these techniques would have been appropriate for observing people's consumption of stories and usage of different storytelling media formats. However, in this project I will use some of these observational techniques during the stage of ideation amongst the designer, supervisor, the software coders and the stage of building the prototype or testing the technological artifact in the form of the storytelling interface. Due to logistical and financial constraints, the participants in the initial stage of exploration won't be subjected to the exercise of keeping diaries or observation. In the stages of ideation or prototype development, I, as the researcher would be using some of the observational techniques to note down the dialogues and interactions between the software developers, the designer (me), the relevant supervisors and the other stakeholders. Observation of the verbal and non-verbal reactions of the participants during or after the testing phase would also be a part of this mode of inquiry.

Eye-tracking

This is one of the most recent developments in technology that is proving increasingly useful for studying the interaction of the users with an interface. Eye-tracking systems 'use cameras or other sensors to continuously track the position or orientation of eyes or other parts of the body' and software is used to 'transform raw data from these sensors into detailed descriptions of where a user looked' (Lazar et al 2012: 370) while examining the interface. There has been significant progress in interpretation of the messy data streams from eye-trackers and using it for drawing

conclusions about the user's cognitive processes or measurement of immersion or engagement (Jennett et al 2007) and in several other areas of human computer interaction (Jacob & Karn 2003; Kumar 2006). In this project, its usefulness can be particularly relevant in the context of storytelling and how users interact with a storytelling interface as interaction is one of the most vital components of oral storytelling. Eye tracking as a part of the storytelling interface and its role in the experimental design will be further elaborated in the later stages of the study when the shape of the interface is firmed up through the different stages of the design process.

Combination of techniques and modifications

The study uses a combination of focus groups, questionnaire survey and an experiment with eye-tracking to draw conclusions about the research questions. These methodological tools serve different purposes independently and as a whole complement each other to achieve the purpose. While the focus groups gave the contours of how different eras of media technologies (orality, literacy and virtuality) create different media consumption practices or cultures that are reflected through our choices and preferences, the questionnaire survey gives a more quantitative estimate about media consumption preferences in the context of remediated interfaces. Data from both these approaches help at a later stage to explain the media consumption outcome of the users (as tracked by the eye-tracker and the scaled questionnaire) for an interface that has ingredients of orality, literacy and virtuality built into the remediation process. Though it must be admitted that the limited sample size of the questionnaire survey and the focus group participants may not be adequate to capture the subliminal effects of orality, literacy and virtuality, they do provide a range of responses that can be typified as representative of different media cultures. As a research methodology, the experimental data obtained from the eye-tracking and the subjective post-test questionnaire provides a set of data on user's real-time usage of the interface. The earlier set of data (collected from focus groups and questionnaire) can be overlapped wherever relevant to draw certain valid conclusions about the process of remediation and its implications.

There have been instances of researchers using certain variations or modifications in the established research techniques to extract the creative potential of the users during the initial exploratory phase. One such methodological approach has been the use of participatory design or co-design methods- 'where users take an active part in the designing process' through drawing or 3-D modelling' and this has 'been found to have significant potential in evolving successful design ideas (Burns & Evans 2000). In the absence of a defined product objective and an 'indeterminate' subject that was yet to be explored, such participatory design methods would not be particularly useful for this project. However, while exploring the speculative idea of oral storytelling in a digital context with new virtual media technology possibilities opening up vast opportunities, it is of utmost importance to make focus group participants talk about the 'ideals', 'blue-sky' or 'what-if' possibilities. The use of focus groups has often been criticized for its tendency to support stereotypes instead of individual ideals because the stereotypes are the most commonly known amongst the participants and that is what they mostly agree upon (Coates 1997). Certain methodological triggers will therefore be used to stimulate novel ideas amongst the focus group participants for this study by encouraging people to think about the future' (Bruseberg & McDonagh-Philp 2001) and come up with new ideas and wishes. For that purpose, futuristic technologies and possibilities would be shown as participants require stimulants to such activities (Bruseberg & McDonagh-Philp 2001) and the discussion would be driven by ideas, personal experiences and possibilities rather than through products.

Summing up: The implementation of the methodology

In discussing the methodology to be adopted for the study, I started off the discussion from the fundamental question of defining the apparently subjective concept of 'design' and the 'process of design'. The elaboration of the debates around 'design' was essential to the creation of the methodology for this study as the process of design or design thinking has often been accused of subjectivity, lack of transparency or of over-simplified explanations through linear design processes. One of the underlying aims of this project is to chronicle the development of the technology artifact with a social-constructivist approach towards technology (as enunciated in the first chapter) and the unpacking of these debates suits that

purpose. Progressing from the definition of 'design' to the evolved concept of 'design thinking' and thereafter to Buchanan's radical approach of 'wicked problems in design' was reflective of my own struggle as a designer researcher to situate the methodology for this design-driven research. The application of the 'wicked problem' approach in design thinking allowed me to borrow from the stages or modes followed by certain design thinking models and redefine them in a manner that suits the 'indeterminate' subject of interface design in this study. For example, the commonly applied mode of 'Empathise' in design thinking was redefined as 'exploration' in this study as the aim was indirectly to explore the 'wickedness' in remediating oral storytelling performance and in a queer way to even add to the wickedness of the problem. The mixed strategy approach in combining qualitative and quantitative techniques was also adopted to suit this uniqueness of the design subject that aims to unravel the underlying connections between media, culture, design and digital technology through the project of remediating oral storytelling performances. The path hereafter will lead me to the implementation of the methodological foundation that was laid down in this chapter. While the modes or the stages of 'exploration' and 'analysis and ideation' and the methodological techniques for carrying out the same have been explained in this chapter, the execution of these stages will be covered through the next chapters. The effort of trudging this long-winding path of methodological debate was perhaps a warped manner of disentangling the knots that prevent us from seeing through the superficial stylization of interface design and observing its core. It closely finds resonance in what Paola Antonelli, Director of R&D at The Museum of Modern Art, New York City says about design.

> "*People think that design is styling. Design is not style. It's not about giving shape to the shell and not giving a damn about the guts. Good design is a renaissance attitude that combines technology, cognitive science, human need and beauty **to** produce something that the world didn't know was missing.*" (Antonelli n.d)

CHAPTER FIVE

Explore and Analyze: The Path to Remediation

Exploring the 'wickedness' (as discussed in the earlier chapter) of the design problem inherent in the intention to remediate oral storytelling on digital interfaces necessitates qualitative research in the exploratory phase through focus groups. The prime objective of the focus groups is to tease out the thoughts and expressions of the participants that reveal the subliminal effects of orality, literacy and the emerging virtual culture on the reception of different media forms and also the imaginative expectations of the participants about new media. However, before I launch into the description of the focus groups, it is necessary to rationalize the choice of orality, literacy and virtuality as the cultural variables that have been chosen for this study. The rationalization will be followed by a discussion on the essential characteristics of these cultures as defined by Ong (1982/2002) and later expanded by Dempsey (2014) for the virtual culture. After laying out the nature of these cultural variables that will be used in the analysis of the focus group data, I will detail the implementation of the focus groups and the survey questionnaires that were used before the starting of the focus group discussions. Thereafter, the focus group data excerpts will be mapped onto some of the key characteristic features of these cultures in a tabular form and the subsequent analysis will involve drawing from the survey questionnaires data to buttress the arguments.

The Cultural Constructs that Shape our Technological Choices

In the earlier chapters, I laid out my methodological perspective of analyzing the survey and focus group data prior to the development process of the technological artifact. The methodology of technology design (that includes the exploratory phase through focus groups and survey) draws its theoretical moorings from the socio-constructivist model of technology development according to which the development of a technology is an output of the social, cultural, economic and political dynamics of human society at a given point of time. The medium theorists (technology determinists) on the other hand provide us with the cultural constructs of orality, literacy and virtuality that are seen as arising out of the technologies of 'orality',

'printing' and 'virtuality'. The ideas of remediation (Bolter & Grusin 1999) and rear view mirror (McLuhan 1967) discussed in earlier chapter indicates the ways in which pre-existing media cultures have been adapted into the new media for the new media to be effective. Bolter & Grusin (1999: 251)) argue about virtual reality (one of the many virtual culture technologies) that 'the technique of visual immersion distinguishes virtual reality from the classic transparent medium, the linear perspective painting'. They also posit that virtual reality can be seen 'to remediate all previous point-of-view technologies' (1999:162). A combined reading of the social constructivist doctrine and that of the medium theorists leads to my assumption that while adapting earlier media into new media is an intrinsic part of the remediation design strategy, it is driven by the fact that the users carry residues of the earlier media conventions into their consumption of the new media. The teasing out of these cultural residues that exist amongst the potential users is therefore of paramount importance while conceptualizing a new media interface and analyzing the user data resulting thereof. In the subsequent sections I will therefore lay out the cultural characteristics of the earlier media cultures (orality and literacy) as posited theoretically and then contrast them with the ones predicted about the virtual culture.

Orality, Literacy and Virtuality: the technology connection

While the socio-cultural dimensions in human society can be multifarious and have been defined in myriad ways, I have chosen the cultural constructs of orality, literacy and virtuality to be relevant for this research as they are media cultures that are believed to correspond with the media technologies of oral, print and virtual technologies. It should be noted that within the limited scope of the research, I have chosen to ignore other variables like economic and political contingencies which also may impact the shaping up of technology and its reception.

Questions have been posed at the idea of 'orality' being assumed as technology, in the same way as the printing press or virtual interfaces are considered to be technologies. In bringing forth the technology connection with the constructs of orality, literacy and virtuality, the definition of '*Information Technology'* becomes pertinent as the following discussion will reveal. Though in common parlance

'information technology' has been a synonym for computer and computer networks, the authoritative *Oxford Dictionary of Media and Communication* by Chandler & Munday (2011: 211) defines it as any technology that is 'used to generate, store, process and /or distribute information electronically including television and telephone'. However, 'information technology' in its wider sense has been used (e.g. Zorkoczy 1985) to refer to any technological system that is meant for processing information, irrespective of the exact means for doing this. In the most recent times, Tan *et al* (2009) define information technology as the application of Information and Communication Technologies tools including computer network, software and hardware required for internet connection. However, for being consistent with my approach of understanding technology as not being limited to the modern industrial technology, I will use Finnegan's (1988) definition to be applicable for this study, in spite of it coming from an era when information technology was in its infancy.

Finnegan (1988:3) posits that information technology can 'refer to any system created to deal with representing, collecting, storing, recording, processing or communicating information in any form through man-made means'. The implication of this interpretation of information technology leads us to conclude that information technology is not limited to the mass usage of the term referred to in the modern-era microchip based communication system. Human society has dabbled with information technology even in the form of smoke and drum signals, alphabetic and non-alphabetic writing, printing press, manuscripts, telephones, television. The most notable and one of the earliest forms of information technology is therefore human language itself. While we have come to the time where oral, written or printed communication is almost assumed to be non-technological by its simplicity and natural availability from the past, in contrast to the intrusive and unnatural technology of the current times, the earlier forms of communication all rest on 'social and cultural conventions' that are human-derived systems of communication. Therefore, an oral language based communication system and its progress into writing skills is as much a human-made technology as micro-chip based electronic communication. The presence of human communities in certain remote areas of the world, where language in both oral and written forms are in primitive forms makes us realize the contribution that 'orality' and 'literacy' (both results of human

endeavors and ingenuity) have made in making the 'information technology' revolution possible. The driving force of every technological artifact in the realm of digital information technology is in the language of software coding which arises out of human being's acquired capability of writing. On a more academic platform, writing has been claimed to have brought about a drastic change in the way people think and argue, and a remodeling of human mental processes (Ong 1982, Harris 1986: 24). The developmental process of human writing was a result of logical experimentation, trials and errors and fluid adjustments over time and that is a typical characteristic of any human-made technology. Therefore making this assumption of the fact that writing was a technology in its own right, it was taken one step further to promote the era of literacy by the logical progression to printing technology that 'both reinforces and transforms the effects of writing on thought and expression'(Ong, 1982: 117).

The democratization of literacy skills made possible by printing technology set up the ground for innovation and consumption in the field of information technology in its myriad forms. 'Writing' is also said to put a 'distance between a man [sic] and his verbal acts' and allows the evaluation and propagation of the verbal acts 'in an objective manner' (Goody 1977:150), which is a pre-requisite for information technology to prosper. Many academics such as Havelock have therefore seen the invention and use of writing as a kind of 'thunder-clap in human history' and an 'intrusion into culture, with results that proved irreversible' (Havelock & Hershbell, 1978: 3).

While 'literacy in the form of writing and printing' will still be relatively easily accepted as a recognizable example of information technology- 'a man [sic] -made means for processing information- in the broad sense of that term', 'orality' may not be 'such an obvious case' (Finnegan 1988:4). Oral communication prima facie looks 'unproblematic' and 'natural' and therefore non-technological. Finnegan (1988) in his seminal work *Literacy and Orality: Studies in the Technology of Communication* argues that it's the generic tendency of human society to take for granted any established system as 'natural' and therefore non-technological when compared to 'the newer (and thus apparently intrusive and unnatural) technologies. He posits that

oral communication like 'literacy or indeed computer technology' too rests on social and cultural conventions and on a human-made system of communication very much like other 'socially created products of human ingenuity and development'(1988:4). It is therefore imperative that when writing and printing are seen as 'information processing systems' that can be classified as earlier forms of information technology, oral culture should be treated as a complementary information processing system or even as a 'counterpoint' to literacy (Finnegan 1988:4). The fact also remains that literacy and information technology could evolve only because oral culture over a large expanse of time developed to achieve high levels of finesse with oral storytelling and public speaking, catching the imagination of the academic and social luminaries in pre-literacy days. Oral skills were deliberated upon, experimented with and taught like any other technological skills by the Greek and Roman philosophers much before the advent of literate society. I would therefore, in agreement with the stance of Finnegan (1988), assume for further discussion the fact that 'literacy and orality' 'can also be classed as information technologies'. The current usage of the term 'literacy' within information technology culture through terms like cyber-literacy, digital literacy or computer-literacy lends credence to the idea of literacy in its original form being a cultural form linked to the technology of printing.

Teasing out Orality, Literacy and Virtuality

In an earlier chapter, I have touched upon earlier research findings and assertions that expose the linkages between the different communication eras and how one spills over into one another. While print media borrowed much of its form and content from the pre-existing oral culture, electronic media and then the virtual media have done the same from earlier media forms. The crux of the discussion done earlier was that in periods of transition the new is defined in the context of the old. However, with the progress of innovation in the new media, the dissonance between the old framework and the new situation becomes increasingly apparent (Kuhn 1970). It can be said with a certain degree of surety that in present times our culture is in such a period of transition (Wyatt 1999), from print literacy and electronic literacy to a virtual culture. But the actual flux of transition that paves the

way for new media innovation and acceptance exists in the mind and thoughts of human users and will remain a matter of conjecture till it is teased out from the general media consumers. This is precisely the purpose that will be served through the focus groups and survey which capture the strands of oral, literate and virtual cultures in this stage of transition in media cultures. The degree to which the new media is being shaped by the old media forms will potentially be portrayed by the choices and anecdotal responses from the participants who belong to the contemporary generation that has its feet both in the pre-existing media as well as the new media that is fast emerging. Separating out the markers of oral, literate and virtual cultures from the conversations of participants will however need the defining characteristics of these cultures as common users of media rarely realize these multiple media cultures existing within us.

Ong (1982) in his seminal work *Orality and Literacy: Technologizing of the Word* maps out the distinguishing characteristics of language, thoughts and expressions in oral and literate cultures. To initiate the discussion, oral cultures are those in which the vast majority of the population is unfamiliar to the technologies of literacy (writing and printing). Ong made the distinction between 'primary oral cultures' which is an oral communication based society that is completely untouched by any sort of writing or printing abilities and 'secondary oral cultures' where it is "essentially a more deliberate and self-conscious orality, based permanently on the use of writing and print" (Ong 1982: 133). Examples of secondary orality are a radio or TV anchor reading out from a given written script. Connected to the concept of primary and secondary orality is the idea of 'oral residues' which Ong describes as the culture where oral cultural characteristics exist in a society that is moving from primary orality to secondary orality. While secondary orality is a phenomenon of a post-literate era, 'oral residue' refers to the oral characteristics in our thoughts and expression when the society was making a transition from primary orality to a pre-dominantly literate society.

Ong presented his constructs in an era which was yet to see the widespread usage of digital information technology. However, his constructs of orality-literacy model appear to be theoretically relevant for analyzing media transitions of any kind in the

past, present and future. Jennifer Camille Dempsey's doctoral dissertation extends Ong's orality-literacy model to lay down features of thoughts and expression that characterize the ubiquitous and multimodal nature of the virtuality culture that is mediated by a plethora of contemporary technology and cannot be explained by pre-existing cultural conventions (Dempsey 2014). I will use the set of contrasting features of thoughts and expressions that characterize the different media cultures of orality, literacy and virtuality (as laid down in a tabular form by Dempsey by building on Ong's model) to analyze the focus group conversations on storytelling technologies. Assuming that our thoughts, expressions and media consumption choices reflect the tendencies that are reflective of the different media cultures, the defining characteristics will help me to separate them out into categories of orality, literacy and virtuality. However, unlike orality and literacy that are well defined due to their long standing presence in human culture, 'virtuality' is a relatively new phenomenon that is still in its infancy, in the same way that orality cultures slowly matured into ones that are more driven by literacy as a result of the influences of reading, writing and text (Dempsey 2014). This newness of the virtual culture and the vast array of technological changes in the last five decades necessitates the contextualization of the term 'virtual' as assumed in this dissertation.

Defining 'Virtual'

The word "virtual" originates from the Latin *vertus*, which means truth. The term 'virtual' means in its current usage "truth-like": something that is not quite true but appears to be true. So, the word can portray something as somewhat less than true or in a way, totally fake or unreal. This is supported by the first of the many definitions provided by the Oxford English Dictionary: 'Almost or nearly as described, but not completely or according to strict definition'(2018). In the context of computing it means 'Not physically existing as such but made by software to appear to do so (Oxford University Press 2018). Though the word 'virtual' has become part of common informal usage in the current context of technological development and usage in media, the term's existence goes way back to the thirteenth century philosopher John Duns Scotus who used the word 'virtual' in the context of 'virtual knowledge' and thereafter has been referenced by many like

philosopher Michael Heim who defined 'virtual' as: "A philosophical term meaning 'not actually but just as if'"(1993: 160). But the word "virtuality" in its current technological context may have been first used by Theodore Nelson (1980) to describe interactive computer systems, who proposed this definition

> By the virtuality of a thing I mean the seeming of it, as distinct from its more concrete "reality," which may not be important. ... I use the term "virtual" in its traditional sense, an opposite of "real". The reality of a movie includes how the scenery was painted and where the actors were repositioned between shots, but who cares? The virtuality of a movie is what seems to be in it (Rheingold 1991: 177).

Nelson's definition seems to be almost the same as the traditional and commonly understood meaning of the word virtual. But on a closer look one can see that it makes a very important shift in meaning and the shift can be judged better when we contrast it with media philosopher Paul Levinson's (1991) definition where he defines a virtual X as one that is obtained after extracting the information structure of X out of the physical structure. Levinson provides the examples of virtual classrooms, libraries, and books who functionally perform the same work as those of the original real entities and yet may not have the look and feel of actual classrooms, libraries, or books. In Nelson's definition, physical similitude is an important parameter for virtuality, whereas Levinson stresses more on the sameness of information structure or the efficiency of the virtual X. It should be noted that both these definitions coincide when we consider virtual reality (virtual reality as experienced through wearables for games and other applications) – the information structure of reality includes its look and feel - but it is not a necessary condition for virtuality. In fact the two definitions of virtuality represent two different concepts (Skagestad 1998) of virtuality and in a sense two different dimensions of the emerging virtual culture. You can expect to observe these two different definitions of virtuality as we tease out the focus group conversations amongst participants who have been born in the era of emerging virtuality.

The discussion on the diverse attempts to define virtuality will be incomplete without the semiotic definition of "virtual" written by Charles Sanders Peirce, the universally

acknowledged founder of modern semiotics "A virtual X (where X is a common noun) is something, not an X, which has the efficiency (virtus) of an X"(1902: 763). Pierce's definition, being the one that is more broadly accepted for the understanding and explanation of virtual culture, also has the same conflict with Nelson's definition that was stated earlier when compared with Levinson's definition. However, interpreting virtual culture through a straight-jacketed view of Levinson or Pierce would make us blind to the diversity of virtual culture that is not limited to artifacts like virtual classrooms, libraries, books, or typewriters that have the same information structure as their original real entities but not the same looks or aesthetic design. I will therefore go with the presumptive stance that Nelson's definition stressing physical similarity with real entities to be as much true for defining virtual culture as that of Levinson or Pierce who consider the efficiency as the 'virtus' of the virtual X. In a given scenario of virtuality, it can be either or both of the two states.

Nelson's definition can be better appreciated if we look back at the first attempt of human beings to create a 'virtual reality' experience through the technology of film projectors. In the darkness of movie theaters, we ignore the reality of camera set ups, artificial lighting and sets and feel the emotions of panic, love or disgust by the virtual world created on the screens of the theater. In reality, there is no real reason to feel those emotions as the experience is a 'virtual' experience. Using Pierce's semiotic definition to interpret Nelson's definition would make it more acceptable when we assume that the efficiency or virtus of a movie is in its seeming (Skagestad 2014) realism. It should be noted that the term 'virtual' or 'virtual reality' may have its own subject-specific technical definition in areas of optics or in information technology but because the research tries to understand the 'virtual culture' as existing in the broad media milieu for the users, the discussion has chosen different types of virtuality interpreted as cultural phenomena and not the term's subject-specific technical usage (Skagestad 1998). That prompts me to add a corollary to the discourse on virtuality which draws on my earlier reference to Stuart Hall's theory of encoding and decoding. The idea of virtuality as a symbolic entity standing for something else is not entirely dependent on how the designer/encoder intends it to be. What is accepted as virtual is also dependent on how the decoder (the user)

interprets the virtual entity based on their personal framework of knowledge, cultural background and personal experiences. The discussion on the definition of 'virtuality' therefore sets up the ground for a more nuanced appreciation of the focus group questions and discussions, the conclusions drawn from the data and its application in the later phase of the research.

Focus Group: Questions and Implementation

Framing the questions for the focus groups and prioritizing them is always the most critical part of running focus groups to elicit the kind of insights that one is looking for. Reiterating the point that has been made earlier, the purpose of the 'exploration' stage in this study is to tease out the nuances of orality, literacy and virtuality cultures in the media consumption choices and gratifications of users. It is also to explore creative ideas of the potential users about the futuristic possibilities of oral storytelling in digital interfaces.

1. What are your personal associations and memories with reading a printed novel as a unique storytelling format? Please tell us some personal stories of your experiences with a printed novel…or your personal memories.
2. Which are those pleasant experiences of reading a printed novel that you miss in an e-book or an audio book? Which of those experiences do you feel should be there even in the digital age?   .
3. What are your memories about stories being narrated to you? By your grandma, grandpa, Dad, mom or teacher.
4. *A Video clip of a professional oral storyteller…*
https://www.youtube.com/watch?v=hPBjbW4L3ko
Please listen from 20.25 minutes till whatever you want to listen. I want to play for three or four minutes and then ask the following question
How would you compare this experience of stories being narrated to you with experiences of reading the same thing from a printed book?
Follow up question: How is it different to listening from an audio book?
5. What for you is the ideal way of consuming a story in the digital future? Does the idea of having a sense of smell, touch and seeing objects related to the story during the story session appeal to you?
We will now show a small clip on some of the most recent technologies.
Clips are shown on technologies that enable olfactory stimulation along with a particular story, or sense of touch or 3-Dimensional Holographic projection.
https://www.youtube.com/watch?v=A31R9wS2eX8
https://www.youtube.com/watch?v=sw4yoE9h4z4
6. Now that you have seen these technological possibilities, how would you imagine the future of a novel? How can these technologies or some more that you know of or can imagine will help in transforming the novel?
7. Which tangible objects can you think of as possible storytelling interface? For example…instead of a printed novel as a tangible object can it be a bottle that can start talking, or even a blanket?

Focus Group Questions

The questions therefore are built to unravel the memory of past events, experiences and conversations (Krueger & Casey 2015) related to storytelling. In designing the questions, certain basic principles for conducting focus groups have been followed. While the initial questions are meant to introduce the topic of discussion and stimulate the participants to start thinking about their personal connections with the topic (Krueger & Casey 2015), the transition questions serve to move slowly into the key questions. In the set of questions given above, all the questions are key questions from the standpoint of the research as every question is meant to reveal a participant's cultural leanings and tendencies. However, in keeping with effective

principles of focus group questioning, the introductory question of asking about 'experiences and personal memories of reading printed novels' starts with an area that would have been invariably experienced by everyone in the group, and therefore helps participants to warm up before facing questions which may require talk on experiences and memories that might not have been experienced by everyone to a similar degree. While printed novels have been experienced by everyone to a greater or lesser degree (amongst the University students), experience with e-books or audio books are not expected to be so universal, though everyone within the participant group of University undergraduates would be very much aware of them. Therefore questions about e-books and audio books have been kept after the initial questions about printed novels.

The purpose of the focus group is also to elicit the subconscious expectations of the digital generation about future possibilities of storytelling interfaces, I decided to follow the advised norm of asking the un-cued questions first and then following it up with cues that take the discussion ahead (Krueger & Casey 2015). After the uncued open-ended question numbered 5, where participants have been asked to offer their imaginative ideas about the future of storytelling interfaces, cues were provided in the form of short videos with futuristic technology possibilities. These videos were meant to open up their minds to new media possibilities that are unknown to many and stimulate them to come out with their subconscious imaginations about storytelling interfaces. While the first video showed a live oral storyteller on a youtube video telling a story, the second one showed 3D holographic technology being used in museums to recreate human characters as narrators, and the third video showed futuristic technology that can provide olfactory sensations which are synchronized with the content of an audio-visual text.

The focus groups sessions (totaling 3) lasted for a maximum of 40 minutes and the number of participants in the groups ranged from 3 to 12. The total number of participants for the focus groups was 18 and all of them were University of Adelaide students whose average age was 22. The only selection criterion was that the participant needed to be a student of the University within the age group of 18-25 fulfilling the minimum English proficiency level required by the University of

Adelaide. The students were recruited through posters put up in the University campus and also through direct communication during class sessions by taking the required permissions from the concerned teacher. Human Research Ethics approval was taken before the focus groups and mandatory rules were followed regarding recruitment and conduct of the focus group.

A pre-focus group questionnaire was provided to all the participants, to be answered within approximately 20 minutes. The questionnaire was aimed at collecting the media usage patterns, relative gratifications and perceptions about different media platforms used for storytelling. The data from the questionnaire survey was used to buttress arguments built on the richer data gathered from the focus groups and theoretical constructs underlying those arguments.

Focus Group: Methodological Clarifications

The number of focus groups to conduct is not only a function of the limitations of time and resources but also the marginal utility of each additional focus group. In this project, both were the reasons for the number of focus groups being limited to three, though the target was to have an optimal number of five. Lack of monetary incentives and the choice of keeping the participants limited to students within the University of Adelaide, made it extremely difficult to get a steady flow of participants within the University. Though there were only three focus groups, the depth of the data collection probably did not suffer immensely because the focus groups met the criterion of having a 'homogeneous audience' (Krueger & Casey 2009) which can reveal definite trends and patterns. All the three focus groups threw up clear and similar themes of experiences and opinions in the context of storytelling. So, it can be assumed that holding a bigger number of focus groups would not have added much to the range of data. However, it would have statistically lent more credence to the validity of the themes or conclusions. The variation in the number of participants ranging from three to twelve was also a uncomfortable reality that I had to accept because of the recruitment constraints as stated earlier. This is with the knowledge that the optimal number of participants in an ideal situation for non-commercial topics is around five to six for each focus group (Krueger & Casey 2009). Having only three participants in a focus group may defy conventional norms

and can be said to suffer from an inadequate number of perspectives in a group due to a low number of participants. However, in this situation, because the agenda was not to test any commercial product but more to explore individual experiences and expectations about storytelling, even a small group of three did succeed reasonably well in having a holistic discussion around the questions. Krueger and Casey (2009) in this respect mentions that small focus groups or mini focus groups with four to six participants are becoming increasingly popular because smaller groups are easier to recruit and host and also make the participants more comfortable.

Focus group participants were selected through convenience sampling with the simple criterion of age between 18-25 and English proficiency. As the objective of the focus groups was to explore the realm of storytelling in a generalized universal context which does not necessitate any stratification or categorization of the potential participants, random convenience sampling from students in any area of specialization or background was found to be adequate. It should be noted that convenience sampling however should not be interpreted as selection of participants by personal choice and networking. Care was taken to avoid selection of any student with whom I, the researcher, am personally related in a teacher-student relationship or have any conflict of interest that influence their responses. As students in the University of Adelaide are selected from diverse backgrounds there is also an inherent randomness in the selection of participants and no preference was shown in selecting students of any particular major or group, Students were requested to participate through posters and hand-outs distributed during or after the University classroom sessions. Some of the participants were also obtained through personal networks of teachers and peers in the University. Though students opting for the focus groups or the survey were random in nature, the weakness in the convenience selection process is that there was no even distribution of students from diverse subject majors. This resulted in concentration of students from arts and humanities partly because of the fact that the researcher (myself) had limited access in recruiting students from science, engineering and medical sciences. This to a certain extent can limit the rigour of the data and the conclusions thereof. The questionnaire survey was exercised on all the eighteen participants of the focus group in Australia. Additionally, it was also conducted with

thirteen more students of St. Xavier's College, Mumbai (India) who had also participated in focus groups after the questionnaire survey. But the focus group recordings had to be rejected because of technical failures that made transcription impossible. So, while the focus group data is collated from a total of eighteen participants, the questionnaire survey data is from a total of thirty one participants (including the eighteen focus group participants).

The basic demographic distribution of the participants in the focus group and the survey participants is as follows:

Focus groups

The total number of participants was eighteen. Out of the eighteen, ten belonged to the female gender while eight were males. The average age of the total number of participants was 23.8. Categorizing them by the subject major, seven belonged to media, one to international studies and ten belonged to linguistics.

Questionnaire Survey:

The total number of participants was thirty one. This includes the eighteen participants of the focus group who also were respondents to the questionnaire. Within the thirty one, twenty three belonged to the female gender and eight belonged to the male gender. The average age of the thirty one participants was 22. Categorizing the thirty one participants by the subject major, seven belonged to media, one to international studies, ten belonged to linguistics, twelve belonged to english literature and one was from the psychology major.

Analysis of the focus group data:

The focus group recordings were transcribed by a professional transcription service (transcriptionAustralia.com). Thereafter, the content analysis was done using the matrix for the characteristics of orality, literacy and virtuality based cultures as presented by Dempsey (2014) (discussed earlier). This research being a PhD dissertation, the content analysis was done by me as the lone content analyst, though using a single content analyst has the obvious drawbacks of subjectivity. Content analysis for focus groups has been classified into three types (Janis cited in Stewart, Shamdasani 2007): pragmatical analysis, semantical analysis and sign-vehicle analysis. While pragmatical analysis may be employed in trying to

understand the attributions of a group of participants concerning their beliefs and reasons behind it, semantical analysis adopts a more numerical approach of counting particular words and expressions to draw conclusions. Sign-vehicle analysis, on the other hand 'classifies content according to the psychophysical properties of signs (counting the number of times specific words or types of words are used)' (Stewart and Shamdasani 2007 p.191). In this project, focus groups were primarily to explore the underlying expectations of the participants about storytelling from different media forms and therefore the pragmatical analysis was adopted as the analytical methodology.

The transcribed texts were first searched for material relevant to the research questions and then sorted into categories based on the interpretive framework of orality, literacy and virtuality based cultures. The material was sorted and coded for statements that reflected the respective features of the oral, literate or virtual culture as outlined by Dempsey (2014). As there was no available precedence for such mapping of the features with actual conversations on storytelling, personal judgement and logic has been used in coding the statements. Thus a degree of subjectivity has to be assumed in the coding. However, future researchers ideally should use multiple analysts to code the same statements and thereby reduce the degree of subjectivity.

Mapping Focus Group conversation to Orality-Literacy-Virtuality

Dempsey backed by Ong's orality-literacy constructs lays down the features of thoughts and expressions in oral, literate and virtual cultures. It needs to be noted before using this framework to analyze the focus group conversations, that the conversations are not by themselves examples of oral, literate or virtual modes of expression. The conversation excerpts however reveal the deeper reasons behind the media choices we make and how those are influenced by underlying cultural forces that are subtly or directly linked to our oral past, literacy or an evolving virtual culture. The framework of cultural features as enunciated by Ong and extended by Dempsey will help to identify the cultural forces (old and the new) that may be directly or indirectly influencing our media choices, gratifications or expectations about future media possibilities. For the ease of understanding and categorization, I

will use a tabular format where excerpts from the focal group conversation will be mapped to features of orality, literacy or virtuality cultures. The items in the column for 'features' have been selectively taken from Dempsey's (2014: 17-18,24-25,52-53) tabulation of the features for orality, literacy and virtuality.

Features	Representative Statements from Focus Group	Notes
Close to Human lifeworld: ➤ Oral cultures must conceptualize and verbalize their knowledge with close reference to human lifeworld ➤ Objective world has immediacy and familiar interaction of human beings through somatic connection ➤ Word of mouth/ sound maintains high interpersonal relations, attractions and antagonisms ➤ Also involves facial expression, gestures, inflection etc, direct somatic ratification	**O1**: And I think it (Oral storytelling) was helped by the fact that it was a very relatable book to us. I very vividly recall that' **O2**: I suppose it wasn't really anything to do with the printed book. It was entirely around the orator. She's there and it was the way she conveyed emotions, would dramatically pause in elements and just really made the story come alive rather than, you know, when you're reading, you're kind of reading at your own pace. She dictated the pace, the tone, and the emotion of the story. **O3**: That (oral storytelling) would be amazing—only because that would be like a spectacle though **O4**: When I imagine live story-telling it would be going to a particular place with a crowd and there would be a narrator sitting there with the book and telling you the story. **O5:** you couldn't just have a boring person giving a narration at a museum. It has to be relevant to the story.	**O1**:Book name was 'Looking for Alibrandi' **O2**: Refers to the same book as before and 'she' refers to the teacher in the participant's primary school. **O3**:'That' refers to going for oral storytelling sessions that are held regularly like movies **O5**: In reaction to the possibility of virtual oral storytellers in museums

Table 1: Orality Culture's Terms and Features mapped to Focus group Statements

Although media culture has moved away from the dominant 'primary oral' traditions of centuries back, its reverberations can be still felt in myriad ways, either through the secondary orality of television, radio talk shows, audio books or through the live

storytelling sessions by storytellers that may come in the form of parents, teachers or professional storytellers. The samples of focus group conversations when mapped to Ong's axiomatic features of oral thoughts and expressions reveal the literate society's deep rooted connections with the objective world's immediacy and human interaction through somatic tools in spite of the dominance of written text, printed books or technology mediated literacy.

When a significant number of participants talk about the attractiveness of the oral performance where the storyteller 'dictates the pace, the tone and the emotion of the story'(O2 in table 1), it's the same features of an oral storyteller which epitomized the oral culture of the Greeks and Romans in the era of Socrates, Aristotle and Plato. The primary oral culture's vitality was centered around the narrator's ability to deliver the content in the present and continues to remain so in the age of technology mediated literacy which is transitioning into virtuality culture. However, in the dominant culture of literacy, secondary orality and the onward march towards virtuality, primary oral characteristics of thought and expression leave a footprint in the early years of childhood when a child uninitiated or inadequately trained in the skills of writing and reading is almost similar to the society in pre-literacy days without any concept of "looking up" something. This is amply displayed by the recurring theme in participants' drawing from memories of oral storytelling by parents and teachers: (referring to school teacher) *'I think.., could have been like fifteen minutes every day where she would read out a novel to us and….and those stages were quite relaxing ..you could just lean your head against table and like rest and like listen to it and like..I don't know, imagine it in your head I suppose'*. The decreasing footprints of such experiences with increasing age they are absorbed into more advanced media cultures of literacy, secondary orality and virtuality are indicated when a participant talking about her views about oral storytelling says: *'I think it was more pleasant as a kid or when you were younger because you didn't have the ability to read yourself that much, so whenever you were reading as a child, like it was a bit more of a chore or like a complex activity'*. This is also supported by the questionnaire survey (provided in APPENDIX) responses to the Question 9: 'When you think of hearing a story being told live by someone to you, whom do you think of?". 58 percent of the responses were for the

option of 'grandma/ grandpa/ father /mother', 23 percent for professional storytellers, 13 percent for teachers and 6 percent for 'someone else'.

The interesting phenomenon to be noted through the conversation excerpts about oral storytelling is also the fact that even long after the childhood experiences of oral storytelling are over, orality does not disappear from our literate or virtual life. Live oral storytelling's appeal resurfaced to serve the gratification of a 'spectacle', as expressed through the statement (Table 1: Excerpt O3) "that would be amazing—only because that would be like a spectacle though". A vivid example of this 'spectacle' phenomenon is seen in the popular 'book reading sessions' where the author her/himself reads sections of the book. Though such sessions would be theoretically seen as 'secondary orality' which Ong (1982: 133) describes as 'essentially a more deliberate and self-conscious orality, based permanently on the use of writing and print' (Ong, 1982: 133), yet they reveal our desire for the oral medium that lies subsumed within the more evolved media of printed books or e-books. One must note that while such a phenomenon has also been explained through the theories on media gratifications, I am trying to bring the focus on the manner in which different mediums co-exist, resurface and impact each other. This will be taken further through the mapping of the conversation extracts with features of literacy (table 2: on next page) and virtuality thereafter.

Features	Representative Statements from Focus Groups	Notes
Concise and Linear • Linear plotline and heavy subordination	**L1**: I finished .. like the other 200 pages until 2am 'cause I had to know how it ended.	Linear progression towards the ending is the dominant norm
Conventional and Traditionalist Knowledge • Freeing the mind of memory work • Allowing the mind to new speculation • Memory locked in visual field	**L2**:I feel like our imagination is diminishing already that if you took away the written word and you have to paint the same from words and it's just there and you just step into it and you don't have to think about it, and I feel like that takes away a part of the magic of it. I don't know. Maybe I'm just into it of written words. I like the written words. I like the – I have my own interpretation of things.	Freedom from the work of memorizing as required in orality, but freeing the mind to imagine different possibilities of same written words

Table 2: Literacy Culture's Terms and Features mapped to Focus group Statements

(Continued on next page)

Table 2 Continued.

Features	Representative Statements from Focus Group	Notes
Distanced from the lifeworld • Writing structures knowledge at a distance from lived experience • Encourages closure and finality •	**L5**: For me, reading a book or listening to a story is very involved. It's not something that I can half-heartedly do so I really need to be in an isolated space of mind to do it	
Layered • Words have layers of meaning	**L6:** Harry Potter is a great example because you could put a hundred Harry Potter fans in a room that all read the book and there's little bits that they'll remember differently or that everyone's got a different favourite part of the book and I just feel like if you put a hundred Harry Potter movie-only fans in a room versus the book, there'd be less differences between their experiences because it's one's person's – well it's a team of people's interpretation as opposed to your own internal interpretation	Reader discovers more layers of meanings through individualized reading as opposed to seeing the movie

Table 2: Literacy Culture's Terms and Features mapped to Focus group Statements

Walter Ong's observation that the shift from orality to literacy was not just a shift in modality but also a paradigm shift in the way human beings began to think can be clearly realized when we compare the excerpts in the tables for orality and literacy.

While statements reflective of orality display our desire for listening to a speaker with multimodal communication, the culture of literacy is shown by the streaks of individualism and desire for isolation (Table 2: excerpt L3 & L4) while absorbing the content through the unimodal media of printed books. In a mind that is driven by literacy, the linearity of book's content, urge to touch the finishing line of the last page (Table 2: excerpt L1) and the gratification of creating emotions, characters and situations dominates our psyche. But in the oral mindset the spotlight is on the live delivery that creates those emotions, the persona of the oral storyteller and an interactive session with a live persona that is never driven by a definite sense of closure. What seems to attract our literate minds even long after we have crossed the age of orality is the fact that the content of an oral storytelling session can be ever evolving with time, space and change of the storyteller unlike a literacy driven media which fixes an opening and closure by the very fact that the content is written down by an author/ s and thereby frozen in time and space for ever. What is amply displayed by these focus group conversation excerpts is that the beauty of the storytelling media's evolution is in the fact that these contrasting offerings of orality and literacy culture are not a story of one replacing the other completely but is a much more complex flux of shifting mindsets within the same human being or the same socio-cultural grouping. The increasing popularity of novels in the audio book format and the publishers reaching a wider population of readers who were intimidated by the voluminous written texts of a popular novel is testimony to the fact that literacy and orality can fall back on each other.

Extending Ong's observation that much before oral culture started influencing literacy in the initial days of the printed books by making available the oral content for printing, literacy also had influenced orality when 'scribes in the middle ages' had 'composed oral discourses through writing, which was essentially still based on oral expression'(Ong 1971). Before going to the excerpts of the focus groups that display thoughts and expressions symptomatic of virtual culture, the comparison of orality and literacy tables give us the take-away that in the current context these two media cultures have become like two different colors in the media palette that are used in different proportions by different individuals and contemporary technology has only helped to mediate these two cultures to satisfy our varying needs to be part of a

communal spectacle, or avoid the burden of reading the text when we do not desire to do so, or delve into the isolation of reading a printed book. However, the seeds of a more evolved media culture lay in the contrasting duality of 'literacy' epitomizing this 'discovery of self-hood' and separating the 'knower from the known' (Havelock 1986: 5), and oral culture's communal storytelling practices closely connected to the lifeworld through the live delivery of an interactive storyteller. The obvious ability of the human mind to seamlessly switch between these two technologies of 'orality' and 'literacy' perhaps lays the ground for a more evolved media culture in the form of 'virtuality'.This will be evident from the following Table 3 (on next page) that lays out the features of virtual culture and their representative statements.

Features	Representative Statements from Focus Groups	Notes
Virtual approach to communication • Focus on multimodal expression and the multisensory	**V1**: let's say you are kind of engaged in a visual way with either a storyteller there or like within the scene, and then if you feel kind of, "Oh, I'm kind of tired of watching it," you can play it back and close your eyes and it can become purely audio or …..you can have it again as like a written form	Moving from visual to aural to written text
Hypermediated • Non-sequential and non-linear organization • Serendipitious discovery through hypertext	**V2**: So if we had hologram storytellers that they would set it up that their story could be told from different perspectives so you could have a neutral narrator with anyone or you could set it up to be the central character as the narrator and the story, and the actual language changes based on who is giving the narration.	User Discovering Multiple perspectives unlike the linear progression in written text or movies
Actualized Created in time and space through concrete sensory actions Multitude of possible states of being, that can be experienced and circumscribed by virtual entity	**V3**: And then as you read it, it can detect where the breeze and then they could probably burst a fan or like chill the air or something	Actualizing the sensory descriptions of breeze or chill

Table 3: Virtuality Culture's Terms and Features mapped to focus group conversations

Features	Representative Statements from Focus Groups	Notes
• A "seemingness" of an entity or sign that holds the place for something else • A focus on the "potential for actualized" human consciousness • Potentiality of entity can fall back on orality and literacy forms but in new contexts, unique combinations and infinite instances, hybridity	**V4**: Little 3D printing with the recording of your parents telling the story and even if it's just a statue of them, it's still them telling the story. So that's a possibility.	The 3D printings are symbols that hold the place for the parents, falling back on the orality and literacy cultures through the use of print and orality
Recursive • Repetition or recurrence of entities and constructs for meaning in new contexts	**V5**: So if we had hologram storytellers that they would set it up that their story could be told from different perspectives so you could have a neutral narrator with anyone or you could set it up to be the central character as the narrator and the story, and the actual language changes	The user having the freedom to consume the same story from different perspectives for meaning in new context

Table 3 (continued): Virtuality Culture's Terms and Features mapped to focus group conversations

Features	Representative Statements from Focus Groups	Notes
Exteriorized and Interiorized Human Lifeworld • Holds the place for something else; stands for something else in lifeworld • Physical structure is removed from its information structure	**V6**: I'm imagining some kind of a witch or something like a broom, that would either project the story or allow you to interact with parts of the story **V7:** I like the idea of the blanket or like a pillow or a couch or something that by getting on it or near it, it interacts with you in a storytelling kind of way. It would have to be something quite relaxing I imagine. **V8**:Yeah, maybe like a rug. I could lie down and it could kind of change the images on the rug as you are engaging in the story. I don't know. I'm just really imagining lying down	Witch, broom and rug stands for something else in life-world Physical structure of witch, broom and rug have been removed from their real-life functional information structure

Table 3 (continued): Virtuality Culture's Terms and Features mapped to focus group conversations

Virtuality culture as reflected in the conversation excerpts of the focus group (table 3) is a culmination of our preference to be interactive or non-interactive at different points of time and situation and also to exist as an individual or in a communal state of mind. The conversation excerpts also show the virtuality culture's dominant desire to explore the 'virtus' or potential of all entities that can deliver the efficiency of the real that it stands for (eg. a broom or rug could be the delivery mechanism for the storytelling). It can be argued that the desire to juxtapose the individual and the communal in virtual culture arises out of our cultural existence where we have both individual and communal identities, we switch between interactive and non-interactive phases and our long tradition of storytelling has given the ability to imagine fictional potential in different entities. Thus the seeds of virtual culture were

arguably created within the womb of cultural traditions representing orality and literacy and the contemporary technologies are only giving shape to those virtual possibilities.

When the participants wish for a situation where they can make a seamless transition from reading a book, to watching it and then hearing it like an oral performance and then again reading it (Table 3, V1), it reflects the most primary feature of the virtual culture 'Potentiality of entity can fall back on orality and literacy forms but in new contexts, unique combinations and infinite instances, hybridity' (Dempsey 2014: 52). The same feature of hybridity can be seen when the participants' wishes for something like a witch or a broom to combine the role of an oral storyteller, a printed novel's textual content and the visual display abilities of a movie projector (Table 3, V4, V6.V7, V8). Drawing from the earlier discussion on the definition of virtuality as used for defining the virtual culture, when the participants wish for the broom or rug or the pillow to be their storyteller of the future, we observe that in the virtual culture mindset, entities having a different use in the lifeworld (a rug is for warmth in daily life, a broom is for sweeping, or fictionally for flying), stands for something else because of their potential to be 'something else' as imagined by the participant. The information structure or the 'efficiency' of an oral storyteller has been infused into the body of a rug and thereby been given the *virtus* of an oral storyteller.

The virtual culture therefore is not merely understood as being represented by the virtual reality games (where virtual reality is a definite technology) or virtual reality applications accessed through wearables. But it's the culture where every object is pregnant with virtual possibilities and these possibilities are very often 'informed by' earlier cultures of orality and literacy, though not necessarily constrained by the features of orality and literacy (Dempsey 2014) or by the features of secondary orality culture (Ong 1982/2002). The fact that virtuality culture is informed by the storytelling formats of earlier cultures and yet not limited by the formats of the earlier cultures, is palpable from the participant's wish to go beyond the linear non-interactive form of literacy to the one that merges orality and literacy and adds the dimension of multiple perspectives of the same story as has been handed down by

the era of literacy. It is the unique expectation reflective of the virtual mindset to have this non-linearity, multiplicity and real-time interactivity with the content and the author, and the same is reflected through a participant's imagination of hologram storytellers who will be telling the same story from the perspective of the different characters and a neutral narrator (Table 3, V5).

When participants make an effort to creatively imagine the future of storytelling interfaces, (Question 5 in focus group questions), the responses also verify the truth in the axiomatic statement made by Dempsey: "although virtuality culture can be mediated by and actualized through contemporary technology, virtuality is not constrained by it because virtuality possesses the quality of potentiality already evident within culture' (Dempsey 2014: 2). The truth behind Dempsey's argument can be realized by recollecting the wishful suggestions of the participants across different focus groups for having futuristic storytelling interfaces in the form of storytelling rugs, brooms or witches. It is not difficult for one to make a backward integration of these speculative interfaces to similar entities that came into existence during the eras of orality and literacy. The 'magic mirror' in *Snow-white* (published as a fairy tale in 1812), though not a storytelling interface, could interact with the Queen and provide answers to her queries about 'who is the fairest of them all'. The magic carpet is also an entity in one of the popular stories of '*One thousand and one nights*' (rooted in medieval age folklore stories and first published in English in 1706) and also been used as an interactive tool in imagination for flying across vast distances. It's interesting to note that the concept of flying carpets has been there in the literary traditions of other cultures also as Solomon's carpet, or in Russian folk tales. It should be noted that both these entities have a completely different function in the real lifeworld but were vested with a potentiality to perform a function that is 'virtual' or not real.

Magic Mirror in Snow-White   Pegagsus in Greek coins   Magic Carpet

'The Wolf among us' game   'Clan of Pegasus' game   'Magic Carpet' Game

Figure 4: Virtual entities in literacy culture virtualized through digital technology

An example that's not exactly related to storytelling but nonetheless illustrates the connection between virtual culture and earlier cultures is that of Pegasus, the mythical winged divine stallion which is one of the most celebrated and popular creatures in Greek mythology. Pegasus originated in a primarily oral culture, was adopted and enhanced by the culture of literacy, for example a wide variety of children's books (The Myth of Pegasus/ The Story of Pegasus) and thereafter has become part of 'virtual culture' in virtual role playing video games like '*Clan of Pegasus'* or '*Flying Unicorn'*. Similar connections can be seen with Magic Mirror which has been used in virtual culture by games like '*The Wolf among Us'* where the protagonist BigBy interacts with the Magic Mirror that interacts only when asked questions in rhyme. Magic Carpet has also been appropriated by the virtual culture as a 3D flying video game developed by Bullfrog Productions and published by Electronic Arts in 1994. I would like to clarify that the participants were imagining mirrors, rugs or pillows as tangible interfaces with the virtual interactive capabilities

of an oral storyteller, and that is obviously in a different context from that of the mythical entities being used by the virtual culture. But the argument that is enhanced by this discussion is the premise that the 'virtual culture's technologies may have taken inspiration for some of its foundations in the primordial elements of storytelling', though 'virtuality is not exclusively dependent upon these traditions' (Dempsey 2014:3). This also qualifies one of the virtual culture's defining features as enunciated in the Table 3 Column 2 :'Phenomenon emerges in virtual moments and different contexts created through technology mediation' (Dempsey 2014: 52).

Marrying the Focus group findings to the Questionnaire Data

Though the purpose of the questionnaire survey was to collect demographic and media consumption patterns of the participants for purposes that were loosely connected to that of the focus group questions, analysis of the questionnaire data throws up findings that help in correlating with the focus group data as and when needed. It needs to be noted that because of a small sample size collected from within the limited student pool of the University, percentages and other quantitative output from the questionnaire responses may lack the rigor that is necessary for drawing water-tight conclusions about cultural patterns. However, the questionnaire responses do act as a trend provider that can point out any gross conflict or discrepancy in my conclusions about media consumption patterns. Within the limited scope of this research, the use of the questionnaire survey should also be seen more as a reasonable research tool that fits into the methodological recipe serving the research goals. Coupling both these data sets collected through two different methods of data collection will help to add more subtlety as opposed to the simplistic assumptions and explanations often provided by media technology designers about why and how people in the current generation choose technology artifacts, in this particular project in the context of storytelling. Though the sample size and characteristics are not truly representative of the diverse story consuming population, as a methodological rationale, combining both the quantitative and qualitative data helps in adding robustness to the conclusions drawn from the focus group study and support the theoretical observations about the transition phase in the media culture in which we currently find ourselves.

A transition phase

A comparison of the three tables based on the mapping of the media cultures to the relevant excerpts from the focus group conversations displays the truth in the theoretical presumption made by earlier research that contemporary technology now is in a similar place to literacy in its infancy, when in the same way that orality cultures matured into ones more focused on literacy due to the influences of reading, writing and text (Dempsey 2014). Extending Ong's postulates on technology and culture, we are still in the process of transition from the dominant culture of technology-mediated literacy to one that is dominantly virtual by technologizing the terms and features of literacy and orality (Ong, 1982/2002). But technologizing the terms and features of orality and literacy in the context of virtuality is a long winding process that is subject to social and cultural choices which often do not follow the simplistic idea of a solely technology driven forward trajectory. As is displayed through the responses from the participants in the focus group, there is the phenomenon of 'literacy residues' that is a logical extension of the concept of 'oral residues' as proposed by medium theorists (Ong 1982/2002). 'Residual Orality' according to medium theorists is the status of a media culture where the thoughts and expressions have been exposed to the culture of writing and printing but in McLuhan's terms have yet to completely 'interiorize' the practices of literacy. We see a similar phenomenon at work when we look at the questionnaire data in conjunction with the focus group findings.

When participants who belong predominantly to the generation of virtual culture technologies were asked about their consumption history (in terms of percentages, Question 3 in questionnaire: Please refer to APPENDIX) between print novels, e-books and audio books, the average consumption for 31 respondents comes to 65% for print novels, 34.4% for e-books and 0.6% for audio books. Comparing this with actual sales data shows that 2017 market share of printed books, e-books and audio books in USA showed percentages of 70%, 17% and 5.6% respectively (statista.com 2018). A very similar result also comes out from the Question 4 where participants were asked to provide preference rating (on a scale of 5: 1 for lowest, 5

for highest) for diverse storytelling formats like print novels, e-books, 2D movies, 3D movies, audio books, theatrical performance and a live narrator (oral storyteller).

Media	Preference Rating (scale of 1-5, 5 Highest)	Ranking
Printed novels	4.1	1
e-books	2.9	3
2D movie	3.7	2
Theatrical performance	2.7	5
3D movie	2.9	3
Audio Books	1.8	6
A good narrator	2.8	4

Table 4: Media preference Ratings

The data compilation of the responses (as provided in Table 4) again throws up printed novels as a clear first choice, followed by 2D movies as the second choice, virtual culture media forms like e-books and 3D movies both taking the third place and 'a good narrator' (or an oral storyteller) and theatrical performance are a very closely ranked 4th and 5th choice. The results reveal the continuing dominance of 'literacy' and 'secondary orality' culture represented by printed novels and 2D movies (movies classified as a form of secondary orality by Ong). A significant finding from the survey results is the fact that participants belonging to a contemporary generation continue to prefer oral performances in the form of theatrical performance or a live narrator/ oral storyteller more than technology mediated orality like audio-books. This finding is buttressed by the results of question number 13 where participants were asked to show their relative preference between an audio book and an oral storyteller narrating the same story. There was a 6:4 ratio in favor of the oral storyteller (obtained by calculating the mean distance of the participants' relative point of preference as marked between the two choices at either ends) in comparison to an audio book. These results from the

questionnaire survey match up significantly with focus group conversations where a dominant section would prefer to hear a story from a live oral storyteller as opposed to an audio book due to the multimodal interactive nature of the communication in a live session where visible emotions and body language of the narrator made the delivery more attractive than an audio-book.

The nature of the flux in contemporary media culture points towards a transition phase as posited by medium theorists with the continuing influence of literacy on a generation which has grown up in the era of internet-powered personal computers and the onslaught of virtual culture products. The focus group excerpts and the discussion around it already indicated the sentiments of the participants tilted towards literacy culture. A very similar mindset reflecting the love for imagination in one's own personal world through reading printed books is observed through the data from the questionnaire survey. The open ended question (Question 5) throws up responses like " *I prefer printed novels, over all of the above formats, because they possess the ability to transport to a different world, wherein my imagination can run wild, and also because I love the smell of the books*" or "*I prefer printed novel or an e-book the most because it is to me the simplest way to enjoy a book and is very separate from a play or a movie as it is a solitary activity*" or "*I can imagine my own versions of the characters and text often has more information about the world that can be explained more easily than visual media, personal thoughts, world building*". Amongst these strong and frequent voices that still prefer to hold on to the practices of the print culture, there are some infrequent voices that say *"I prefer movie the most as I am not interested in reading and video and images and sounds are more attractive"* or *"e-books are far more easily available compared to printed novels, the availability of light is not an issue. E-books can be carried in one device, whereas, printed novels cannot"* or *"(I prefer) eBook because it is more convenient while travelling and there is no haste about forgetting the book or a heavy load"*. Though such voices are still in the minority, they do form a significant minority as can be seen from the earlier data on preference rating for e-books in table 4. The tabulation of results (on next page Table 5) from the responses to the exploratory statements as given in Question 15 (a to s) also quantifies these conservative sentiments regarding new storytelling platforms.

Question No.	Statement	Strongly disagree (%)	Disagree	neutral	Agree	Strongly Agree
15 a	E-books are just a digital copy of the printed books	0	3	13	68	16
15 b	Printed novels make me feel that I am reading a novel, but e-books do not	6	19	16	39	19
15 c	E-books are like food pills, while printed novel is like the real food	10	19	19	39	13
15 f	E-book novels make me far more engrossed in the story than print books ever can	23	35	35	3	3
15 h	When I say a novel, I always mean a printed novel	10	16	19	32	23

Table 5: Tilt towards printed books (figures in %)

The strong tilt towards literacy based printed books is not hard to spot even if we leave out the percentages who have stayed neutral. The significant percentages of

'neutral' responses probably also point towards the phase of transition when we are hovering between the past and the present. Considering all the five statements together, it can be assumed that e-books are being perceived as a mere copy of printed books on a digital platform and not a product that makes a dramatic shift in the mode of storytelling. This assumption may or may not have any direct correlation with the sales or usage frequency of e-books, but is only reflective of the perception about e-books as a remediation of printed books.

Ergonomic Issues

When the division in the preferences as seen above is coupled with certain relevant responses from the open ended question (Q5) from questionnaire, it points towards factors beyond mere cultural residues. This is about the ergonomic factors in technology design that may retard the widespread acceptance of new media technologies. A few examples of such responses include "I like having something tangible to read and is easier on my eyes in comparison to reading on bright screen", "printed novels give me quiet time to reflect while reading the story away from technology", "printed novel easy to read, protect our eyes" or "it is easy for me to read a printed novel because I can read it while I am lying on the bed". Similar ergonomic concerns have also been shown about preference for 2D movies against 3D movies "they (2D) movies don't require special glasses which I have often have to wear over my glasses which gives me a headache". Focus group participants also have pointed towards the discomfort in reading an e-book while they are on bed, or exposure to light from e-books causing strain on eyes during prolonged reading.

The Desire for Tangible Technology Interfaces

The focus group discussions threw up creative imagination of new interfaces from participants (without any professional knowledge of virtual technology) in the form of pillows, rugs and brooms (discussed earlier) and though the participants were unaware of it, they happen to be perfect examples of tangible interfaces. Tangible interfaces are the most recent advances in virtual culture technology that go beyond the screen-based digital interfaces like PCs and instead manage to seamlessly couple virtual data to physical objects that human beings can interact with through

touch, voice or eyes. This is also noted as one of the typical features of virtual culture where any object from the real lifeworld (that may not look like X) acquires the potential or *virtus* to stand for X by acquiring the information structure of X. We see a similar desire expressed in the questionnaire survey when a significant percentage of the participants express their preference to touch and turn the pages of the printed books, or even smell it and the lack of that tangibility in an e-book. Though this desire for doodling or dog-earing is not considered to be a desirable behavior in the current cultural context and is highly discouraged by the libraries, yet the preference for doing so by a significant percentage of the participants probably indicates the desire for tangibility. The following table compiles the preference rating for statements from question 15 that relate to the tangibility of the printed book. It can be seen from the total of the percentages for 'Agree' and 'Strongly Agree' that either a majority or a significantly high percentage prefer the tangibility of the printed books.

Qstn. No.	Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
15 d	I love dog-earing the pages of a printed novel	23	19	19	29	10
15 e	The only thing that I miss in an e-book novel is the feel of the pages and holding the novel in my hand.	3	26	6	42	23
15 g	I love doodling and writing small notes while I read a printed novel	23	26	19	26	6
15 i	I can't gift e-books, or store them as a memory of my past, I miss that	0	10	26	42	19

Table 6: Statements related to tangibility of printed books

Summing Up: Implication for technology artifact/ interface designers:

The point to be noted from the analysis of data (as done above) is the fact that this dominating preference for printed books against e-books, for 2D movies against 3D movies, or preference for the live oral narrator against the more evolved audio-books is not from a generation that grew up in an era of literacy or orality. The fact that these choices come from a generation which has been born with the internet being a given way of life (average age is 22) and who are avid users of virtual culture products like virtual reality games, virtual classrooms and other virtual communication modes, has implications for the designers of technology artifacts. If not anything else, it points to the peculiarities of story consumption and factors that are not merely related to the material functionality of a given technology or a design but these preferences/opinions arise out of deep rooted cultural factors that have pre-existed for centuries. For designers, it therefore becomes necessary to understand that a reader cannot be dubbed as old –fashioned or slow adapter if she/he wants to hold a physical book with pages or smell a book and therefore rejects an e-book or if she/he prefers to listen to an oral storyteller rather than through audio books. The underlying message is his or her preference for tangibility provided by a printed book (a product of literacy culture) and not a mere replication of a book on a digital screen. The reader's desire to listen to a story from a pillow or a broom has to be traced to his/her subliminal desire to listen to 'literacy' culture's content through 'oral' delivery and hoping for that to be achieved through virtual culture's technological possibilities. The implications for designers of a media technological artifact have been listed below as a summary of the discussions and examples used in this chapter. Though all of these broad tenets may not be directly applied while developing the interface in this study, they reveal the wickedness inherent in the design problem for any remediation initiative.

a. Transitions of media cultures are generally marked by a 'rear view' mirror phenomenon (Mcluhan & Fiore 1967), when in the initial phase of the new technology, both designers and users will often fall back upon the older cultural practices in order to usher in the new technology. This can be amply seen from the focus group data where participants borrow from earlier media cultures of

orality and literacy in fulfilling their needs for storytelling. This is not necessarily to be interpreted as a weakness of the designer or the technology or the users but an inevitable phase for the transition to a new media mindset. In fact, it will be an integral part of design assumptions in this study.

b. As said earlier, the contours of the virtual culture will be shaped to a large extent by the technologizing of the features of orality and literacy (Ong 1982/2002). But the 'technologizing' for the expansion of the virtuality culture, unlike the media technologies of the earlier eras, has to assume the story consumer's expectations of moving seamlessly between the individual and the communal and also between different media cultures.

c. The virtual culture unlike other previous cultures also has unleashed the power of the story consumer to digitize his or her own individual imagination and thereby reshape everything that was so far outside the power of the story consumer. The idea of virtual is not merely restricted to the virtual reality that we experience by wearing a wearable headgear, but it goes beyond that to unleash the power of the story consumer to transform any object from the life-world (which has a different use in normal life) into a potential storyteller.

d. However, the fulcrum of this whole process of expanding into a new culture is always in discovering the precise areas in which 'the contemporary culture is thinking differently as a species as we collectively educate each other in more immersive ways' (Dempsey 2014: 2). I would stress on the word 'immersive' as its implication for the designer is paramount along with its dialectical opposite phenomenon called 'distraction'. These two terms and their related terms like 'engagement' or 'presence' will be taken up in a more detailed technical context in the next chapter. However, at this point it is sufficient to recollect from the earlier part of the chapter as to how a participant's sense of immersion (participant uses the term 'engagement') into the story was distracted by the strain of the light from e-book or a participant mentioned the distraction in seeing a 3D movie due to the technological requirement of an extra eye glass. Without going into technical rationale, a naïve observer can easily realize that the quality of one's media consumption can be benchmarked in part by the degree of

immersion or distraction that she/he feels during the process of storytelling through a medium. This is irrespective of any of the media era that we belong to. The only difference that each era creates is in how the dialectics of immersion or distraction is handled by the media and the features of the media that aid or retard it. While the printed book, the dominating media technology of the literacy era is aided by its tangible interface of paper that can be turned, the cover of the book or the smell of the book that can be stimulating, the era of orality also has its own range of features like the voice, emotion, looks or the props used by the oral storyteller to aid the process of immersion or reduce distraction. For an example, question 14 in the questionnaire survey indicates the relative importance of emotions, voice quality and facial expressions (average rank of 1st, 2nd and 3rd) over the much distantly lower ranked parameters of 'interacting with listeners', 'props' and 'interacting through touch'(average rank of 4th , 5th. And 6th) in the oral delivery of a storyteller.

Limitations of the Cultural Variables

Going into the next chapter where I delve into the actual building process of the prototype, I will sum up the direction of the research that this chapter has aimed to provide. Though this chapter has been overtly reliant on the matrix of features for orality, literacy and virtuality cultures as posited by Ong and extended by Dempsey, there are limitations and omissions that are present in assuming these neatly defined cultural eras. Ong delineates the 'electronic and broadcasting era' as symptomatic of secondary orality where orality is dependent on the literacy of printed texts and scripts. But for the purpose of this study, it needs to be mentioned that the electronic era through its media forms like radio and television ushered in a culture of content being projected through a device that has a defined screen face. The culture of screen based media was also enhanced through the medium of cinema. In keeping with my earlier arguments about how the materiality of technology interfaces create their own cultural norms, I would posit that the expectations built by the screen-based culture in the electronic era may have effect on the expectations from any new media interface in virtual culture which may or may not have screen based interfaces.

Several media researchers have also been critical of such neat categorizations and believe that they are more intertwined than what Ong believes them to be. Jensen (1990:135) indirectly critiques that 'earlier work [in which he includes Orality and Literacy] has overstated the transition from a print culture to a visual culture'. Ess, Kawabalta, and Kurosaki (2007:953) have been critical for Ong's 'tendency toward a technological determinism that is no longer seen to hold up in the face of empirical evidence'. In recent times, researchers have also concluded that 'mixtures of oral and literate influences in modern cultures are complex and so interwoven as to defy simple analysis' (Biernatzki 2007:17). But a more balanced appraisal of Ong's work takes the position that Ong laid a 'foundation for understanding how the two tendencies interact within the same cultural environment' (Biernatzki 2007:17) and this chapter tries to extend the understanding to the ways in which the emerging virtual culture also gets impacted by the interaction. The survey and focus group findings where individual participants display thoughts and expressions as a mixture of different media cultures, perhaps lend credence to the understanding that these cultures are often intertwined and not neatly segregated within us. The focus group and survey findings from potential users have been loosely mapped to the interaction matrix between these three media cultures. The upcoming chapters have been aimed to understand and unpack this process of actualization of the virtual culture (through the design process of a prototype) and exploring the ways in which this cultural mix impacts our creation and usage of a new media interface.

CHAPTER SIX

The Details of the Design: Development and Implementation

The earlier two chapters delved respectively on 'design thinking methodology' and thereafter initiating the design process by 'exploring' the potential users of storytelling media through focus groups and questionnaire survey. As stated earlier, the purpose of the exploration of potential users was not to solve a specific interface design problem or a functional inadequacy in an interface. It was more so about exploring the transitional status of the media culture with respect to the storytelling media as existing in the mind of the users. It was to expand more into the culture of virtuality. It was also to see how the new media paradigm owes its genetic make-up to pre-existing media cultures like orality and literacy. The data from the exploration of the potential users pointed out the broader idea of how the design of the storytelling interface in virtual culture is not going to be merely about using 'virtual technology' that is either available or in the pipeline. But the 'wickedness' of the design problem that is often overlooked is in taking cognizance of how the pre-existing cultures of orality and literacy act subliminally to set the expectations for the expansion of the virtual culture. The data from the focus groups and questionnaire survey in that sense helped me firm up the rationale for building the prototype. It will also help to reflect on my own actions and thoughts as I carry out the building process of the prototype with the help of the undergraduate programmers and analyse the actual user data obtained after the prototype is user-tested.

The earlier chapter ended with the need to build a prototype that would help me to further explore specific areas in which virtual culture is making us think and act differently in contrast to 'orality' and 'literacy' based story consumption. I had used Dempsey's (2014) theoretical delineation of the characteristics of orality, literacy and virtuality to analyse the focus group data. However, Dempsey (2014) herself admits in her thesis that 'it is difficult to capture the essence of orality and virtuality through writing' (p.45) as both are cultures based on actual lived experiences and not on literary texts. The implications of remediating an oral storyteller onto a digital interface with virtual elements can therefore be best experienced through the actual

process of building the prototype and its usage by the trial users. Trying to explore what remediation does when we move from one technology to another technology has been a subject of earlier research too. In somewhat similar vein Gorichanaz (2016) attempted to explore the differences that arise in the reader's experience when a book is remediated with technologies offering different affordances. His research examines reader reviews of two books Ulysses and Infinite Jest in three formats: hardcover, audiobook and Kindle. The findings of the study point out that 'while immersive experiences occur across all formats' , reviewers of the hardcover books 'demonstrated deeper experiences with the novels', and reviewers of audiobooks and kindle revealed 'sensitivity to issues in the remediation process' (2016: 1). Though Gorichanaz's study words the conclusion as 'sensitivity to issues in the remediation process', a complete reading of the study details will indicate that these sensitivities to the remediation process in audio book and kindle formats are closely linked to the awareness of the new media amongst the readers. This awareness of the media or sensitivity towards its presence has been posited as 'hypermediacy' of the media form where the users become conscious of the fact that the content is being mediated.

Thus, thinking and acting differently in a virtual culture could have multiple dimensions and areas of research given the multiplicity of technologies and choices of remediation available to the interface designers. But this research project will use 'immersion' and its' dialectical opposite of 'distraction' as pivotal points to observe the quantitative and qualitative implications of an oral storyteller being remediated into a digital platform. The findings are potentially expected to reveal certain features of virtual reality culture as opposed to other pre-existing media cultures and also what this specific effort at remediation means for the designers and the users. Immersion has been shown to be one of the most essential aspects of fiction reading (in the era of literacy) when the readers metaphorically wish to be lost in the book and which in more academic terms would be referred to as being immersed in the fictional world (Gerrig 1993, Nell 1988, Ryan 2001a, 2004b). Immersion 'as we have all experienced is a matter of degree' and also different kinds of immersion can be differentiated (Mangen 2008: 406). However, considering the vast array of possibilities of storytelling in the virtual era, and the different purposes for which

recreational storytelling can happen, a common ground is the area of 'immersion' that cuts across all forms of storytelling. The concept of immersion and its dialectical opposite of 'distraction' in the context of storytelling will therefore be laid out in further detail in order to pave the way for explaining the prototype and the experiment thereof.

Immersion in Story consumption

Immersion has been a frequently used term by computer 'gamers and reviewers' and used to refer to a situation where 'people find the game so engaging that they do not notice things around them, such as the amount of time that has passed' (Jennett et al 2008). This definition of immersion is very closely linked to other constructs like flow, presence and cognitive absorption that have been extensively used in research related to gaming and virtual reality. The comparison with these other similar constructs will be taken up later when I elaborate on the experimental setup and measurement apparatus. At this stage, I will suggest that the idea of immersion is a concept that has been closely linked to consumption of fiction.

Though this phenomenon of getting lost in the fictional world while reading or listening has been there ever since storytelling has existed, in the current context of virtual culture, there is a kind of immersion that we experience when we experience a fictional virtual (literal sense of the word) world through virtual reality installations, computer simulations or while playing computer games. In such experiences, the sense of immersion to a significant extent is 'created and sustained through the technological features and material devices involved in its display (data gloves, headset, other devices typically providing haptic feedback or also stunning graphics allowing seamless and fast movement, and other visual features providing a sense of agency)'(Mangen 2008: 406). Though in a gaming situation, the technological features act along with other factors like the rule structures of the game, pacing, challenges and rewards to enhance immersion, the objective of the technological features is to achieve immersion through their materiality. This is in contrast to the immersion that is achieved through our own sense of imagination. In case of symbolic representations achieved through the 'text, whether purely linguistic or multi-modal, digital or print – displayed by means of any technological platform' (Mangen 2008) we create a fictional, virtual world (figurative sense of the word)

through our own mental and cognitive abilities. Unlike the earlier kind of immersion, the physical and technical features of the book become almost transparent in order to stimulate the immersion. It should be noted that this phenomenon of transparency of the medium has also been addressed by Bolter & Grusin (1999) through their concept of 'transparent immediacy' in the process of remediation (explained in the earlier chapters). Mangen borrowing partly from Marie-Laure Ryann's typology of immersion (2001a) describes the former kind of immersion achieved through the technological features as 'technological immersion' and the latter that is sustained through our own imagination as 'phenomenological immersion'. It should be noted that phenomenology deals broadly with the concept of experience as lived by an individual, and the idea of phenomenology has been used for studying experiences of users with different technologies. However, Mangen chooses to use the term 'phenomenological immersion' in the context of reading printed books for heuristic reasons. Because digital texts or virtual reality scenarios offer no tangibility or materiality, unlike reading printed texts which is a materially lived experience, she argues that the former does not become part of the phenomenon that we perceive. As there is no distinction between the real and the invisible (Mangen 2008) in the virtual world, the immersion experienced therein is also qualitatively different from that of immersion through a lived experience.

Irrespective of the strength of her arguments in defending her terminology of immersion, the consistent point of Mangen's argument across her body of work over the years is in drawing a distinction between the different kinds of immersion that arise out of the differences in the materiality of the technology. Baron (2014) echoes similar ideas when he reviews the research comparing print and digitized text and argues that digital text mostly is negatively correlated to deep reading, rereading and strong emotional involvement. It may be difficult to accept Mangen's strong position about digital platforms in the context of reading stories in totality as there are others like Gorichanaz (2016) who claim that the book's technology is not as invisible as Mangen claims it to be and immersion can happen even without the technology being invisible. However, Mangen's school of thought does have strong relevance for this research to the extent that the affordances of any given media technology plays a vital role in the kind of phenomenological immersion that the

consumer of a story experiences. The concept of affordance as posited in the primary phase by Gibson (1979/1986) defines it as the range of possibilities that may arise from a person's perception of a given technology in a specific environment. More importantly, a relevant corollary to that is the idea that affordances of a given technology are not static, as they also depend on "how people perceive the affordances of the object in a particular physical, social and historical situation' (Lundh & Johnson 2015: 56). Lundh and Johnson (2015) after reviewing studies on the relative affordances of different kinds of talking books conclude that a person's interaction with a book or the content of the book can vary depending on the affordances of different book formats. Wittokower (2011) with his study on audio books is also supportive of Mangen's stance by stating that even while audio books are drawing from certain aspects of orality, they however offer only a limited number of affordances of speech and different audiobook listening devices may offer different experiences of story consumption. A resonance of Mangen's view is found in the focus group discussions and questionnaire survey findings where a significant majority expressed their affinity towards the print books because of the affordances of the printed paper or the cover of the book vis a vis the technological barrier to immersion created by the light of the e-book readers or the glasses to be worn for the 3D movies. Contrary to Mangen's position, there are also others in the same focus groups and surveys (a significant minority) who have not experienced any difference in their reading experience of the story due to change from print to digital technology and shown strong preference for e-books because of their easy portability and other digital functionalities.

Implications for the Interface Development

At this stage, a pertinent question may arise in the mind of the reader as to what these findings imply for the interface development in this study that aims to remediate oral storytelling through appropriate technologies of the virtual culture? First of all, these findings are fundamental to the complex terrain of remediation when technology platforms are changed for story consumption. Irrespective of storytelling platforms, the need and occurrence of immersion (technological/ and phenomenological) will be there as that is the primary purpose for which one is involved in any recreational story consumption. So a live oral storyteller of oral

culture aimed as much to get his or her audience immersed in the story as would an author of a printed novel or the designer of an e-book reader or a movie or television soap. Therefore exploring and understanding the manner in which different media technologies will impact the way we become immersed will not only enhance our design thinking in virtual culture technologies but also help explain anomalies, if any. As the dialectical opposite of 'immersion' is the concept of 'distraction' which is assumed to reduce one's experience of immersion due to the switching of attention to something unrelated to the story, I will also briefly elaborate on that as an essential part of the interface design. All media technologies ranging from orality and printing technology to the digital technologies can arguably be susceptible to distractions during the process of story consumption by the user. The reasons for such distractions may be multifarious ranging from the individual's personal reasons and environmental distractions to reasons linked to the technology itself. While personal reasons can vary across individuals due to their mental state which is unrelated to the story, environmental distractions can happen due to ambient noise or movement of entities that are unrelated to the story consumption. A common example of this is the distraction caused by the movement of people or the crying of an infant during the screening of a movie. Each technology within its given range of affordances also has its own possibilities of distractions. For example, during digital reading of texts readers generally scan the text on the screen (Coiro 2007, De Stefano & LeFebre 2007; Liu 2005, 2006; Ohno 2007) and such scanning of text digitally is mostly vulnerable to 'distractions' as options are available for 'attentional switching and auto-stimulating our attentional response'(Mangen 2008) through click of the mouse, pressing of a button or clicking a hyperlink. In contrast a printed book offers no such choice with a static text and a fixed perceptual phenomenon. The only choice that a printed book offers in response to any distractions due to personal or environmental factors is to put the book away and not to read at all. In terms of technological distractions a book can also have distractions that may arise from reasons like fonts, weight of the book, quality of printing, paper or the legibility of illustrations and these distractions may impact the experience of reading a story. Because each act of remediation will possibly have potential for such distractions and the experience of consuming the story (reflected through immersion) may

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thereby be affected, it becomes worthwhile to study the immersive potential of remediated storytelling platforms in the virtual culture and understand the manner in which the immersion may be enhanced or constrained.

I will take up in greater detail the scope of measuring immersion or distraction in the sphere of storytelling as I progress through the actual design of the prototype. But before I get into the details of the prototype building and the measurements to be carried out, I found it relevant to look at some of the earlier research efforts to create storytelling prototypes in the virtual culture, though the research goals of those studies might be fundamentally different.

Earlier attempts in creating alternative storytelling prototypes

Given the diversity of technologies and the myriad number of ways storytelling has branched out, the fundamental intention for the prototype building in this research is to explore the implications of putting the old wine of oral storytelling in the new bottle i.e. the virtual era and explore the accompanying ramifications on story consumption. Therefore, before building the prototype, I looked at a cross-section of examples of prototypes that have attempted to use virtual storytellers, though they may be entirely with different research goals.

Silva, Raimundo and Paiva (2003) attempted to bring interactivity to a virtual storyteller by allowing the users of the system (targeted towards children) to alter the course of the story or the manner in which it was being told. Silva et al (2001) had already presented the concept of a simple virtual storyteller in their earlier work but in the later version the aim was to make the synthetic 3D grandad on a screen-based interface 'be able to tell the content of the story in a natural way, expressing the proper emotional state as the story progresses and capturing the user's attention in the same way a human storyteller would' (Silva et al 2003: 146). The interface allows the users to put their inputs to the system through cards that have symbolic images (tagged with bar codes).
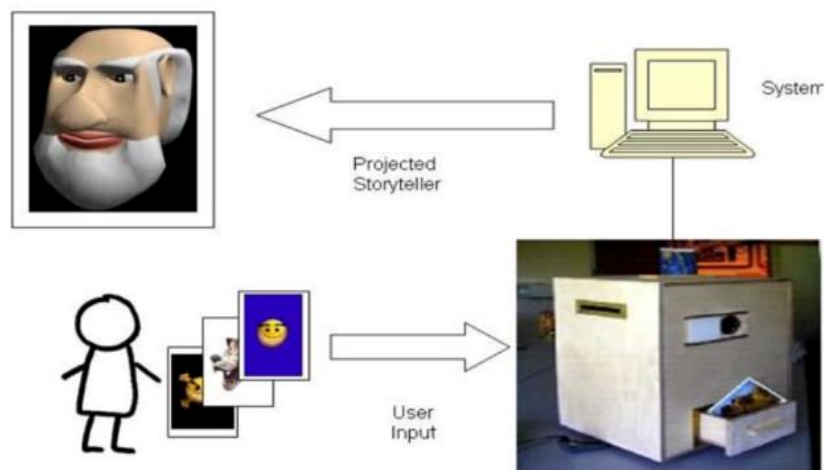
Fig. 4. Input using the Influence Box

Figure 5: The Virtual Storytelling System by Silva et al (2003: 151).

For example, if the user wants the story to be told in a more scary way, s/he may choose a scary sign and that will then impact the way the story will be told by the virtual storyteller. The changes in the virtual storyteller's verbal output (changes in the emotion or tone of delivery) according to the user's inputs were carried out by changing the parameters of the text-to-speech engine. At the story level, interactivity was created through different levels of the story having diverse branching options. While the children did appreciate the interactivity in the Little Red Riding Hood story achieved through a tangible input mechanism, the limitations of the study (as mentioned by the researchers) were mainly in the text-to-speech engine that hampered the understanding of the story. The researchers have indicated that a better result could have been achieved by improvement of the text-to-speech or by having a human recorded voice provided by a professional narrator.

While Silva *et al's* (2003) 3D virtual storyteller was displayed through projection of the computer display onto a screen, there have been others who have created virtual storytellers in a virtual reality environment. Theune *et al* (2003) created a 3D replica of a Virtual Music Centre (VMC) that has embodied agents as receptionist, piano player, dancer and a virtual storyteller. The specific research areas addressed in the project were the following (Theune *et al* 2003):

– Automatic plot development by characters as intelligent agents

– Turning a plot into a narrative using natural language generation

– Story presentation by embodied, speaking agents in a virtual environment

– Involving the user in the story creation process (interactivity)

The most significant contribution of Theune *et al's* (2003) VMC was the freedom of the virtual characters to go beyond the scripted narratives (which has been usually the norm in virtual storytellers) and allow the plot to emerge out of the dynamic interaction between the characters in a given situation that falls within the overarching plot of the story.

Kim *et al* 2011 used Augmented Reality (AR) to bring about a novel improvement to a real-life fairy tale storyteller. The human storyteller's face was detected and traced in real-time and using markers based on AR they were able to show illustrations related to the story in a speech bubble. A virtual image was thus combined with a real image to enable the storyteller to convey relevant story contents to the audience who saw it projected on a screen (please refer to the Figure 6 & 7).

Figure 6: The Human Storyteller juxtaposed through AR to real-time speech bubbles with relevant content   Source: Kim et al (2011: 3)

Figure 7: The speech bubbles with Content changing in tandem with story

Source: Kim et al (2011:3)

The viewing choices and the feedback from the audience who were simultaneously exposed to projections with and without the augmented reality illustrations gave rise to the conclusion that the overwhelming majority had switched to watching the projection with the AR illustration feature and preferred the same in their feedback.

There have been other projects in which Augmented Reality technology has been used to complement the storytelling experience through the interfaces of a 3D foldable tangible cube interface by means of 3D graphics, 3D sound and 3D sense of touch (Zhou *et al* 2004). It is interesting to note that all of these virtual storyteller

prototypes that were discussed above have been built for children as the target audience and also user tested by children. There are several other examples of collaborative storytelling prototypes developed for children across the world which directly or indirectly use oral storytelling practices to improve literacy and storytelling skills of the children. Story Dice (Taxen *et al* 2001), StoryMat (Ryokai & Cassell 1999) or Virtual Puppet Theater (Andrei *et al* 2001, Klesen *et al* 2000) are some of them.

Apart from these prototypes that have expanded the horizon of storytelling in the virtual culture through the innovative use of embodied characters, dynamic story creation agents, artificial intelligence or augmented reality, an area of research that is showing increasing traction is in the area of emotion recognition in virtual reality situations. One of the prime motivating factors for Virtual Reality technology has been to create 'engaging immersive environments' 'in the realm of telling stories'(Blom & Beckhaus 2005). This need to evoke emotions in the audience is perhaps a prime motivation for not only virtual environments but also for all storytelling in general ranging from oral storytellers of yore to movies or novels. Blom and Beckhaus (2005) actually extend the earlier models of interactive storytelling systems with emotions modelling and tracking. The components of the system include story segments with information about the expected user response, a modelled emotional path for each emotion category through the story, and an internal emotion tracking system, trying to predict the current emotional state of the user.

Please note that these are representative examples for the diverse areas of work in the realm of virtual storyteller prototypes and therefore not an exhaustive list of work in the field. There are several other instances of prototype building projects in the area of virtual storyteller with similar research goals. However, these representative examples so far discussed helped me to draw certain conclusive observations about the nature of their research goals and their inherent gaps. These studies are mostly to solve very specific issues of the design/technology that range from verbal delivery issues of the virtual storyteller to the simulation of human-like emotions in the embodied agents, perfecting the embodied agents for story delivery or creating an interactive story engine that can respond to the user's inputs by creating dynamic

stories. The thrust of these projects or ones that are similar to them (consciously or unconsciously) are therefore linked to issues of 'technological immersion' which in other words can be expressed as engagement with the technological interface. There is no doubt that such exercises in interactive storytelling or virtual reality technology (as discussed above) often are successful in serving their own niche purposes, whether in fostering creativity or linguistic ability of children or to take a technology forward. However, they do not address larger issues about how the reception to these new media technologies are influenced by earlier media cultures or what essential difference they bring to the experience of the story consumption when compared to the traditional form of oral storytelling. To be more specific, these studies give rise to the following observations:

a. It's true that virtual reality technologies offer diverse opportunities for creating interactive story consumption. But is interactivity in a storytelling experience a desirable parameter to incorporate? If yes, then what is the rationale behind it and what kinds of interactivity maintain or enhance the 'phenomenological immersion' (Mangen 2008) that book readers have been found to avidly defend in the findings of the focus groups or the questionnaire survey?

b. When the software is empowered with AI that can track or predict emotions, the AI is obviously modelled on certain known facts about our emotional response patterns. However, past research as discussed before has shown that the nature of our emotional responses or reactions while consuming a story can vary depending on the technology of the media. There is a significant possibility that our emotional response patterns may be different in certain ways while reading the story of 'Lady Chatterley's Lover' from a printed book vis a vis experiencing the same story in a virtual reality environment. What are those differences?

c. What difference does it make to the story consumption experience when a real-life oral storyteller is given the ability (through AR technology) of showing story-related visuals that complements the oral delivery as against the traditional storyteller lacking such abilities? Specifically, how does the remediation impact the nature and quantum of immersion and distraction or the underlying constructs of 'immediacy' and 'hypermediacy' (Bolter & Grusin 1999)?

d. Almost all of the prototypes (discussed above) have been developed with children as the target audience and this is a representative trend for several other such storytelling initiatives. While this is surely not a criticism of the studies, there appears to be a paucity of studies that aim to understand how similar initiatives will impact the teenage adults/ and adults who play a deciding role in the progress of virtual culture.

The Prototype Design Directives

The prototype interface for the project was built in the Media Lab of the School of Information Technology and Mathematical Sciences, University of South Australia, Mawson Lakes. Two undergraduate students of Media Technology implemented the design directives as part of their multimedia project requirement for the academic year. Technology choices (use of Unity software), other material resources like availability of editing suites, time restrictions for the delivery of the undergraduate project were beyond my control and were fixed according to the budget and course requirements of the University. In the interface development process, I played the role of the designer who provided the overall concept of the interface design, the layout of the interface experience that is desired as an outcome and the necessary inputs for the content that was necessary for the storytelling platform. Aesthetic issues about the interface design were decided in a collaborative manner through mutual discussions and guidance of the supervising Faculty member. The software coding in Unity software was carried out by the undergraduate students to the best of their abilities and I had no contribution or role in the actual process of the coding. Based on the literature review of relationships between media cultures and technology, the focus group and the questionnaire survey findings (as discussed in earlier chapters) and the representative examples of exploratory prototypes of storytelling in virtual culture, I laid out a charter of guidelines that helped me to communicate the design philosophy and the purpose of this experiment to the software team.

The Design Goal: In normal technology interface design situations, the design goal could have been defined as technology-specific as 'to integrate Augmented reality technology in building an oral storytelling interface' or 'to build an AI driven interactive story engine that will take inputs from the audience'. However, because

this is not a technology-demonstrator project but is more to explore the interaction of human beings with virtual culture technologies, I set my purpose in more exploratory terms.

- Tracking the engagement of the audience with a virtual oral storytelling Avatar in an oral storytelling performance.

- Contrasting the reactions from the above with an interface having exactly the same features as the one with the Avatar but delivers the audio track of the story without the presence of the Avatar. This basically served as a control for the experiment.

The Design Concept: The 3D Avatar of an oral storyteller will narrate a story or an excerpt from a classic popular novel for a solo audience on a 2D computer interface with a neutral 3D background that is unrelated to the story. The audience is expected potentially to interact with the virtual storyteller only through his/her eyes and therefore the technology interface design should be able to capture the gaze data of the audience. This data capture and the subsequent interpretations will potentially help me to draw conclusions about the aspect of eye gaze of the audience in a virtual storytelling scenario, immersion and distractions involved therein and thereby add to the body of knowledge on the characteristics of virtual culture. For future researchers in the field of developing AI of embodied agents, it would potentially add depth to the virtual storyteller's AI algorithm that drives the non-verbal eye interaction with the audience.

The Design Elements for the Primary Interface:

The Avatar: A woman in the age group of 30-35 was selected as an animated embodied agent who would be the 3D avatar of a woman oral storyteller. The reason for selecting the female gender was because the best possible narration of the story was done by a female voice artist. Please note that the choice of a female voice artist was more out of a constraint rather than a conscious choice in the given situation. Embodied agents are digital, visual representations of an interface which mostly takes on the human form (Cassell et al 2002). The use of embodied agents has become a very common phenomenon in the field of gaming and educational software (Cassell et al 2000, Schroeder 2002). The earlier examples of storytelling

interfaces used cartoonish or sometimes abstract representations of oral storytellers, mainly because the assumption behind such interfaces was the likability of cartoonish or abstract representations amongst children. However, in current times designers are taking advantage of the technologies that allow for the creation of embodied agents that are more human-like in appearance and behaviour (Groom et al 2009). As my intention was to situate live oral storytellers on a virtual platform with as much realism as possible, the undergraduate software developers were directed to create a 3D avatar of an oral storyteller with as much realism as possible within the limitations of the budget, time, the expertise of the undergraduate students, and the availability of required multimedia technologies. Considerable time and effort was spent in getting the best possible lip synchronization during the narration by the 3D avatar, along with natural consistent head, neck and eye gaze movements.

The Background: My design direction to the software coders was to keep the background to the oral storyteller as a neutral background without any entity having any direct relation to the story being narrated. This was with the rationale that in a real-life traditional oral storytelling scenario, the storytelling performance often happened outdoors and the background in such a case essentially had no correlation with the story being narrated. However, partly because of the limitations of the budget and the limited choice offered by the Unity Asset Store for 3D background elements within that budget, the software coders made a choice of this given background which had a tinge of apocalyptic feel. All elements in the background however represented real-life objects and the background was devoid of any imaginary objects or entities that you would not encounter in real life. As a design instruction, the background had to be one which had a dynamic environment where there were multiple sources of distraction as we are likely to encounter in a real-life outdoor storytelling session. A man walking away at a proportionate distance of around 100 metres behind the 3D avatar, was consciously introduced into the background for serving as a specific source of distraction. All other potential sources of distraction were unintended. As part of the experimental design, a static image of a gorilla moving across the screen for a very short period of time was also

used as a potential source of distraction. The usage of the gorilla image and the rationale behind it will be explained later in the chapter.

The Narration Content: The script for the story session is a small excerpt lasting for 3 minutes from the gothic novel *Dracula* (see Annexure) written by Bram Stoker (1897). Matching background music that tried to evoke a sensation of horror and suspense was used. The audio track for the excerpt from *Dracula* was recorded by a female voice. In the narration, no acknowledgement is made about the fact that the excerpt is from the novel *Dracula*, leaving it to sheer chance that any of the participants may or may not realize the original source after listening to the complete excerpt. The decision to get the track recorded by a real-life voice artist rather than using a text-to-speech engine was influenced by the experience of the earlier researchers Silva *et al* (discussed earlier) where the text-to-speech narration used for the virtual storyteller was found to be ineffective and sounded artificial due to the limited capability of the technology.

The Interface Interactivity: In a real-life oral storytelling performance, the storyteller establishes a connection with his or her audience through eye contact, personal expression, and interaction with the audience (Schiro, 2004). The interaction of the real oral storytellers with the audience happens when they observe their audience for verbal and non-verbal feedback and accordingly adapt their stories as they go along (Silva *et al* 2003). I chose to focus only on the aspect of gaze that is known to serve critical social functions such as communicating interpersonal attitude or affect between speaker and listener. The oral storyteller is expected to maintain eye contact with the audience (Van Groenou, 1995; Zabel, 1991). Earlier researchers have realized the need for any humanoid robot to be aware of its audience and able to direct its gaze in a natural way. There has been significant research in developing the AI that helps the humanoid storytelling robot or the virtual embodied conversational agent to be aware of its audience and able to direct its gaze in the most natural way simulating normal human gaze patterns. While interaction between the audience and the embodied agent functioning as the oral storyteller can use varied media like speech, gaze, face, gestures, body posture, I decided to focus on the factor of 'gaze' as virtual culture is characterized

by its emphasis on the 'visual' and also partly due to the availability of technology options for this project within the given institutional infrastructure.

In our physical real world, gaze is a mutual medium of interaction and used for different reasons by the speaker and the listener. For an example, the embodied virtual agent functioning as the oral storyteller like any real human storyteller is expected to gaze at listeners more when she/he intends to be more persuasive, deceptive, ingratiating or assertive (Kleinke 1986). The listeners to the story also display their own gaze patterns that carry significant implications for the storyteller. However, given the research focus of this project that primarily wants to observe the human reaction to a virtual oral storyteller which is representative of the virtual culture, I directed my design priority towards tracking the gaze of the listener while listening to and watching the virtual storyteller. This is at variance with research priorities that focus towards developing more naturalized gaze of the virtual storyteller.

Some examples of very fundamental research related to the listener's gaze towards the speaker in our real physical world shows that the eye-contact displayed by the listener towards the speaker is a non-verbal determinant of the speaker credibility (Beebe 1974). It has been also been observed that people gaze on the speaker and his/her immediate surroundings more while listening than while speaking (Argyle & Cook 1976; Duncan & Fiske 1977; Kleinke, Staneski, & Berger 1975: Kleinke, Staneski, & Pipp, 1975). Research participants have been seen to gaze less at the speaker when they were recalling material involving competing rather than noncompeting associations (Stanley & Martin, 1968). A seminal research project that helped me in conceptualising the focus for the design of the interface interaction was the finding by Argyle and Graham (1976) which reported that there were steadily decreasing amounts of mutual gaze between people when they were exposed to visual stimuli that competed more and more for their attention. This can be seen as an indicator of being distracted by visual stimuli that competed with the speaker's message or the speaker.

Summing up, as a conscious choice the Interface interactivity will therefore be kept devoid of any interaction between the listener and the embodied agent through conventional modes like mouse, voice or touch. The potential non-verbal interaction

through eyes will be left as an open possibility in the mind of the listener, though in reality the embodied agent won't be empowered to read the eyes of the listener in real-time. However, the gaze of the listener all through the storytelling session will be tracked and recorded for drawing interpretations on the listener's immersion and distractions in the course of listening to a 3D virtual oral storyteller set in a virtual background scene.

The Designer: Juggling between Theories, Data, Material Constraints

An inquisitive reader goaded by the 'social-constructivist' idea of technology (discussed in chapter 1) may question at this point about why the choices of the design elements are as they are and what precisely gave rise to those design choices. Questions would be also be justified if the designer is asked to explain the rationale behind his assumption that these design choices have relevant connections to the larger scheme of socio-cultural characteristics and needs. It is obvious that the final design choices in any project are almost always arrived at as a culmination of the juggling of diverse factors like the primary intention behind the design situation, the constraints of the available technology, finiteness of the project funding and an intuitive mix of creative logic of the designer tempered by the user study data from potential users. But as I have pointed out in the very introduction of this thesis, rarely do designers engage in reflecting on their own choices and priorities through the lens of macro theoretical constructs from the field of media studies and design. While the micro factors like availability of relevant technology, user study data or the financial constraints play consciously in the mind of the designer, macro socio-cultural factors or media's evolutionary history that play a dominant role in the genesis of the design problem itself or even shaping the user's feedback and the designer's own design decisions fall beyond the realm of their immediate concern. Unexplainable design choices or the user's needs often find shelter under the factor of intuitive creativity of the designer or the subjectivity of the human needs respectively. But I would argue based on my discussion on the 'wicked theory of design' (in chapter 3), that the wickedness of the design problem lies precisely in comprehending these broader socio-cultural factors that shape the design problem, the user's needs and desires and the potential solution through the lens of relevant theories. In the earlier chapter, the user's understanding of the

storytelling interfaces and their desires were teased out by using the terms and features of orality, literacy and virtuality, conceptual constructs of the medium theorists. I ended the chapter with the design implications from the findings. Given below is further detailing of the theories and findings that were part of the juggling process giving finality to the design elements.

Design Choices and the Theory

Rear View Mirror: In making the final design choices within the given constraints of technology, labour and financial resources, I relied heavily on the phenomenon of the 'rear view mirror' (McLuhan 1964) which was initially discussed in the earlier chapter. To recapitulate the idea, it points towards the phenomenon where in a culture of media transition we tend to borrow significantly from our earlier media practices to build the futuristic media interfaces. The fact that we are in a phase of media transition was amply established through literature reviews and factual data culled from the focus groups and the questionnaire survey. The intention to situate oral storytelling in the virtual culture threw up multiple interface design options. The options range from using a pillow or a rug as the oral storytelling interface (as we discovered in the focus group discussions) to having holographic 3D projection of an oral storyteller. Irrespective of the possible options that I could come up with, it displayed the phenomenon of 'rear view mirror' at work where the interface design and the content would borrow intentionally or unintentionally, directly or indirectly from earlier media eras. Thus, the two major elements of the final design directives (as listed earlier) in the form of '3D Avatar of the oral storyteller', and the 'narrative content from the novel *Dracula* are also a throwback to the live oral storyteller from orality and the content of a novel which is a literary format from the era of literacy respectively. The interface also borrowed from the culture of projecting within a screen with a definite aspect ratio (2D computer screen in this case) which is different from some of the non-screen based media forms like laser holography. This conscious decision to choose certain key elements of the interface for remediating the live oral storyteller to a digital interface in the virtual culture is consistent of a process of borrowing where the content of one medium is always another medium (McLuhan 1964). It may not be the only path to choose in light of the fact that stories told in the oral cultures originally were not written in a 'novel'

format but used different delivery tools like repetitive cues and mnemonics to aid the process of story consumption. However, this being an initial step in the remediation initiative, it was considered prudent to maintain certain elements as a constant to aid the process of observation and analysis.

As a practice, it is consistent with the earlier eras where the Dutch painters included maps, globes, inscriptions, letters and mirrors' in their paintings, or the technology of writing was primarily based on the contents of speech in the initial period, written words and speech thereafter were used as the content by printing technology and print moved on to become the content of the telegraph (McLuhan 1964) or even other media like movies and television. Even while being a conscious borrower in this design process, empowered by the knowledge about the historical precedents of 'borrowing' during the transitional periods in media technologies, I realised that the technology of the virtual culture gave me a different degree of freedom in this process of borrowing. Unlike other technologies of the past, it gave me the freedom as a designer to not only borrow the content of an earlier medium to be used as a part of the new medium (the *Dracula* Story from Literacy era), but also borrow the interface for the earlier medium of speech (the oral storyteller) and virtualize the same by creating a virtual 3D avatar. The screen based interface of a computer that was used also can be traced back to that of the television and movies. This is also as a phenomenon similar to the phenomenon of e-books where digital technology borrowed not only the printed book's content from the era of literacy but also the interface of printed books and creating a virtual representation of the same.

Theory of Remediation: While I have used McLuhan's Rear View mirror metaphor (that was originally placed within the context of the Medium theory) to provide the rationale for the choices of design elements from pre-existing media practices, Bolter & Grusin (1999) look at the same phenomenon more specifically from an interface design perspective in new media, and term it as an integral part of 'remediation'. Remediation is the 'representation of one medium in another' medium and Bolter & Grusin (1999) argue that 'remediation is a defining characteristic of the new digital media' (45). However, Bolter & Grusin's concepts of 'immediacy' and 'hypermediacy' in the process of remediation are the ones that help in understanding my own choices. In deciding on the interactivity of the interface, it

was my choice that the technology of the medium should be minimal in its visible presence. Therefore, interacting devices like mouse, touch or any kind of wearable which is not a tool for interaction in a real-life oral storytelling scenario was ruled out. Even the eye-tracking technology (detailed later) that would be used to track the listener's gaze would be a very subtle device that would be fixed to the base of the computer and would not be a wearable eye tracker. The idea was to get the listener to forget the role of the intervening technology of the medium as much as possible. Bolter and Grusin (1999) call the same intention as the concept of 'immediacy' that dominates all new media initiatives where 'immediacy' mandates that the medium itself should disappear and leave us in the presence of the thing represented: sitting in race car or standing on a mountaintop. The apt examples of media striving for 'immediacy' are in the realistic landscapes or portraits painted with utmost realism to make the viewer forget the medium of canvas and paint, or the projection of films in a dark theatre where great effort is spent to make the viewers believe in the scene that is being projected as real and thereby evoke real emotions. It should be noted that these persistent efforts of media designers to achieve immediacy are intricately linked to the ultimate goals of achieving a higher degree of immersion and the related factors like flow and presence.

One of the typical ways in which designers of digital media try to achieve 'immediacy' is by borrowing from each other as well as from their analog predecessors such as film, television and photograph (Bolter & Grusin 1999). One of the finest example of this is in music videos where directors borrow from multiple media to create the effect of immediacy and spontaneity. However, this borrowing from multiple media also creates a simultaneous effect of 'hypermediacy'. Hypermediacy is in fact the counter of immediacy where the effort to make a new medium always leads to one being conscious of the new medium either due to the technology involved in the new media or due to the incorporation of other pre-existing technologies. New digital media therefore is said to oscillate between immediacy and hypermediacy (Bolton & Grusin 1999). Though 'ideally there should be no difference between the experience of seeing a painting in person and on the computer screen', in reality this is never so as the hypermediacy of the interface comes into play when the 'computer intervenes and makes its presence felt in some

way', either through an icon that the user has to click or a scroll bar to slide or due to the graininess of the image or the difference between the real and the virtual that is used to represent the real (Bolter and Grusin 1999: 40). I will elaborate on the applicability of immediacy and hypermediacy in my design situation in the later parts of this chapter as I elaborate on the exact details of the interface and the design of the experiment.

To counter the effect of hypermediacy, interface designers adopt different methods that create immediacy by making one forget the presence of other borrowed media within a new media. I raise this point regarding remediation to explain the intuitive decision of mine in not mentioning the name of the original novel 'Dracula' or the author in the narration of the excerpt. It was my rationale that the mention of the original medium from which the excerpt has been borrowed would have reduced the immediacy and brought in 'hypermediacy'. The intention was to make the medium disappear as much as possible and allow the 3D oral storyteller to be the narrator of a story that did not allow the memories of the printed novel to interfere with the focus towards the storyteller.

From the perspective of 'remediation', my intuitive decision of avoiding the mention of the original source medium while borrowing from it, finds resonance in the way both contemporary media and the old media have carried out their acts of remediation. In contemporary media, Hollywood has frequently and successfully adapted their movies from classic novels like those of Jane Austen, staying true to the original printed novel in costume and setting, and yet most of the times do not 'contain overt reference to the novels on which they are based' and 'do not acknowledge that they are adaptations' (Bolter & Grusin 1999: 44). Bolter & Grusin (1999) argue that acknowledging the novels directly would interfere with the illusion of immediacy that Austen's readers would expect and the aim is to make the viewers view the film in the same seamless manner in which they have read the novel.

Such practices have been prevalent even in the earlier eras when biblical stories were illustrated through paintings or orally communicated popular stories were made into printed novels without making any mention of the original source.

With the theoretical rationale behind the choices of the primary design elements laid out, I will now elaborate on the complete set-up for the interface experience and experiment thereof.

The Complete Interface Experience and Experimental set-up

The Concept

This study sets out to explore the relative experiences of two randomly assigned groups of participants when they hear a fictional audio narration, one group from a 3D digitally animated oral storyteller (avatar) and another without the presence of any virtual storyteller. By comparing and contrasting the experience of the participants with the two different interfaces, I explore the effects of mediating oral storytelling through a virtual medium in terms of distraction, the linkage between distraction and immersion and retrospective time estimate. 'Retrospective time estimate' (detailed later) is a participant's self-reported estimate of the time that has elapsed during the storytelling session on the interface and functions as an indirect measure of the quantum of immersion. The study is primarily based on the premise that if the presence or absence of the 3D digital animated oral storyteller does make a difference to the way a story is experienced in a virtual interface, then this would affect the degree of immersion or distraction experienced by the participants on the two different interfaces. This difference in the degrees of immersion would be captured by the subjective questionnaire measure of immersion and distraction and corroborated by the objective measures of the same variables through eye-tracking. I will now undertake to elaborate the experimental concept, its underlying rationale and the elucidation of the technicalities concerned.

Design

The study was a 'between groups' design where half of the participants (15) were randomly assigned to NO-AVATAR Interface (Figure 8) where they listened to an audio track of a story excerpt (see Appendix) narrated from *Dracula* (Stoker 1897) while looking at a computer screen. The other participants were assigned to AVATAR interface (Figure 9) where they listen to the same audio track on the same computer screen but through a 3D digital animated oral storyteller. Please note that

both groups had the same animated 3D background in the interface, one without the avatar and the other with it. The primary dependent variables were immersion, distraction and retrospective perception of time as measured by post-test subjective questionnaire and eye-tracking.

Apparatus

The interfaces for both the groups were created using custom software written with Unity 5.2 and displayed on a computer screen having a 51 cm display window with a screen resolution of 1920*1080. The script for the story session was taken from the novel *Dracula* (see Appendix) and matching background music that evoked a sensation of horror and suspense was used. The audio track for the excerpt from *Dracula* was recorded by a female voice, with the 3D digital animated oral storyteller for the AVATAR interface also being female. The 3D female storyteller (see Figure 8) had the abilities to nod her head and move her eyeballs. The 3D avatar's lips were also in synchronization with the narration. This was achieved through the functionalities provided by Unity software. However, unlike a human storyteller, the avatar lacked the ability to make gestures through hand or head during the narration. As discussed earlier, in both conditions, an animated apocalyptic background that had no relation to the story being narrated was shown for both the interfaces to mimic normal storytelling situations where the background has no relation to the story. Attached to the computer screen (at the base) was a TobiPRO-X3-120 eye tracker used for collecting eye-gaze data of the participants (see Figure 10) during the storytelling session on both conditions.

Figure 8: The AVATAR interface with the 3D avatar of a woman storyteller

Figure 9: NO-AVATAR interface with the same background but no avatar

Procedure

Before showing the participants to the respective interfaces, they were given a pre-study questionnaire (see Appendix) that captures preferences regarding media choices and storytelling. The primary instructions for both the groups were the same. To ensure uniformity, instructions were read out from a script, instructing them that they could look anywhere on the screen but they were required to watch the story until the end. No mention was made to them that questions may be asked about the story in the post-test questionnaire or there may or may not be a 3D digital animated oral narrator. This was done to maintain a similar condition of involvement and expectation from the stimulus and factor out any extra level of engagement from the participant that might boost the value of immersion. The participants were made to sit at a comfortable position at a distance of approximately 35cm from the display. At the very start, eye-calibration was carried out for every participant. During the eye-calibration process, the eye-tracker measures the characteristics of the eyes of the participant and uses the data to measure the gaze data of the participant. There was no restriction on head movement or head position after the eye-calibration is over.

Eye-Tracking unit fixed at the base of the screen
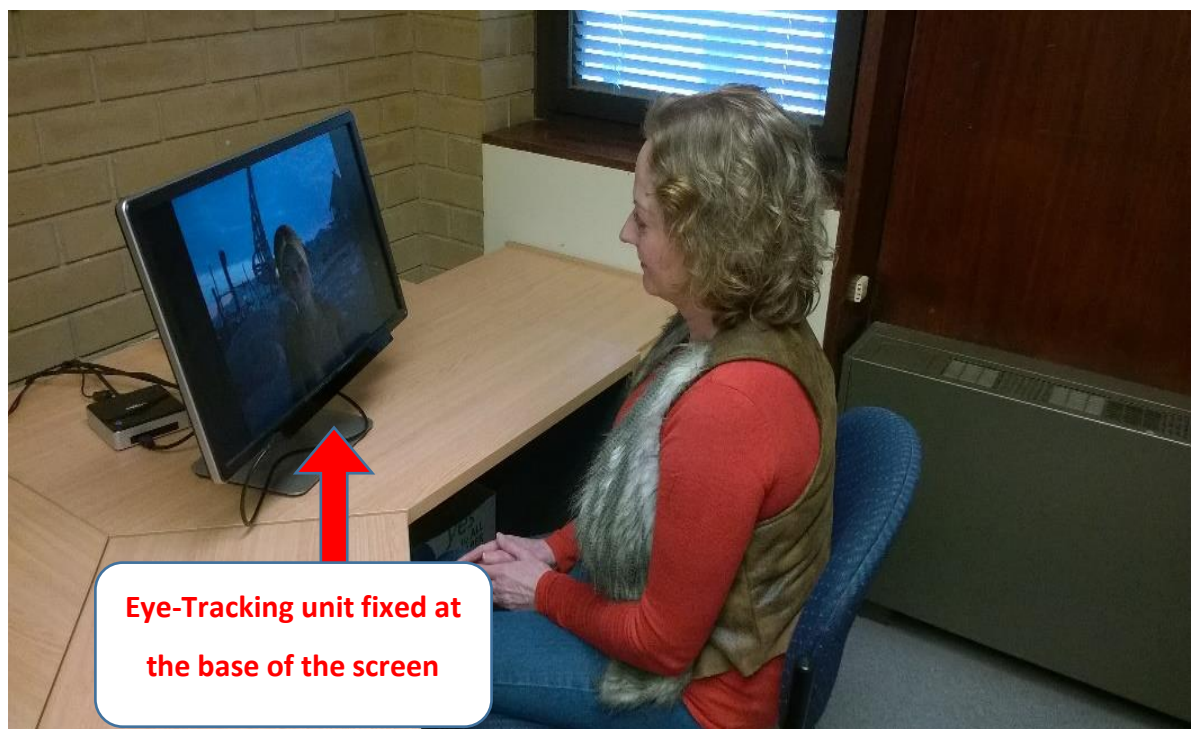
Figure 10: Participant in front of the interface

The total time that the participants had to spend in front of the computer screen for both groups was 4 minutes with a variation of 20-30 seconds for differences in the time taken for eye-calibration. Out of the 4 minutes, the story narration runs for 3 minutes 10 seconds. During the process of storytelling in both interface 1 and interface 2, the participant's gaze data were tracked with the TobiPRO-X3-120 eye tracker for the full length of 3 minutes 10 seconds.

Around the middle of the storytelling process (1 minute 30 seconds after the storytelling has started), a static image of a gorilla which is proportionately the same dimensions as the 3D digital animated oral storyteller's image (20.5cms height, 16cms maximum width), moved horizontally in a linear path across the screen from the right to the left. The horizontal line of movement is such that it is exactly above the head of the 3D virtual storyteller (20.5cm from the bottom of the screen) without over-lapping with the image of the storyteller. The movement of the gorilla image in the case of NO-AVATAR interface which does not have any oral storyteller, is also exactly at the same distance from the bottom of the screen. A walking man in a black coat (referred to as 'walker', see Fig.11) was also built into the background as a possible source of distraction for the audience during the process of storytelling. The gorilla image remains on the screen for approximately 6 seconds for both the interfaces. After each story, the participants from both the groups were given the same questionnaire that intends to measure the degree of immersion and distraction. The experimental set-up involving certain distractions like the gorilla and the walking man is based on the concepts of 'inattentional blindness' that will be elaborated in the subsequent part. The questionnaires for measuring the degree of immersion and distraction also have been modelled on past research that will be discussed in the next part of the chapter.

Figure 11: AVATAR INTERFACE with the 'walker' distraction inside the circle
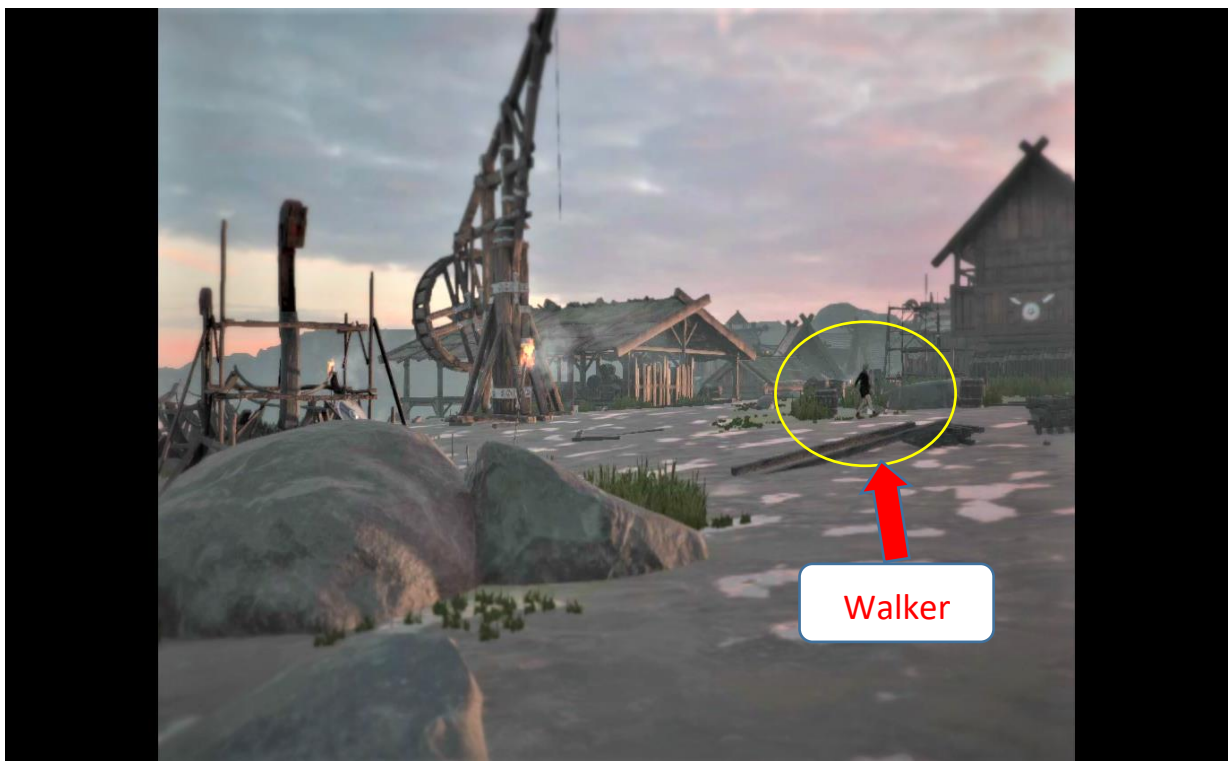
Figure 12: NO-AVATAR interface with the 'walker' distraction in circle

Figure 13: AVATAR interface with 'gorilla' distraction.

Figure 14: NO-AVATAR interface with the 'gorilla' distraction

Immersion in storytelling

Immersion has been a frequently used term by computer 'gamers and reviewers' and used to refer to a situation where 'people find the game so engaging that they do not notice things around them, such as the amount of time that has passed' (Jennett et al 2008: 641). Most immersion measurement studies and concepts related to immersion, like flow (Csikszentmihalyi 1975, 1990), cognitive absorption (Agarwal & Karahana 2000) or presence (Slater et al 1994, Zahorik & Jenson 1998) have emerged out of studies on gaming environments with very few studies applying it to the experience of storytelling. Within the both the gaming community and research there has been a 'broad understanding of immersion' but 'it is still not clear what exactly is meant by immersion and what is causing it' (Jennett *et al* 2008). The seminal work on immersion by Brown and Cairns (2004) identified three progressive levels of immersion namely 'engagement', 'engrossment' and 'total immersion'. Based on that, Jennett *et al's* (2008) work on the measurement of immersion in games identified three broad characteristics of immersion as applied to virtual games

- lack of awareness of time,
- loss of awareness of the real world, and
- involvement and a sense of being in the task environment.

The study also makes a distinct differentiation between 'immersion' and the concepts of 'flow', 'cognitive absorption' and 'presence', even while it accepts that certain characteristics of the three concepts are also embedded within the experience of 'immersion'. While 'flow' essentially has to do with the degree of involvement in an activity (Csikszentmihalyi 1975, 1990), cognitive absorption is the degree of involvement with the software (Agarwal & Karahana 2000) and presence is the psychological sense of being in a virtual environment, immersion is differentiated from the three in being concerned 'with the psychological experience of engaging with a computer game' (Jennett et al 2008: 643). When this study is contrasted with the similar work of Busselle & Bilandzic (2009) that tries to create a measure for engagement or immersion in the area of storytelling, there is a differentiation made out between the concept of 'telepresence' and 'narrative

presence'. While telepresence came out of being present in a computer mediated environment (Biocca 2002, Lee 2004), narrative presence is 'the sensation of being present in a narrative world due to comprehension processes and perspective taking' (Busselle & Bilandzic 2009:325). Flow in a game like activity makes the player 'focused on the most important few aspects of their immediate reality' but viewers and readers of a narrative 'become immersed in an alternative reality (Busselle & Bilandzic 2009: 325). Also, unlike non-narrative activities where one has 'heightened awareness of one's own self in an artificial environment', in a narrative activity it is the opposite, 'a loss of awareness of oneself' due to perspective taking with protagonists or sympathetic characters'(Busselle & Bilannzic 2009: 325). However, in both non-narrative and narrative activities, there may be a loss of awareness of the passage of time. The above conceptual positions on immersion and its measurement have been used to design the subjective questionnaire and will be discussed in further detail in the section on the development of the questionnaire.

Immersion and Distraction

In order to compare the relative magnitude of immersion for the two different interfaces through objective measures, the concept of distraction has been used in the study. This is because earlier findings show that narrative engagement or immersion competes with other mental processes for cognitive and emotional resources (Busselle & Bilandzic 2008). If resources are shifted away from comprehension then mental model construction and therefore engagement should suffer. It can be assumed that any process unrelated to the narrative may have that effect (e.g., noise, hunger, job, stress or an unrelated image). Therefore, 'a negative component of narrative engagement is distraction—the presence of thoughts that are unrelated to the narrative' (Busselle & Bilandzic 2009). This is tantamount to saying that the more engaged you are, the less distracted you will be by any unrelated image or item that is capable of distraction. Nordahl & Korsgaard (2009) have used the concept of distraction and its relationship with 'presence as immersion' in a similar study to track levels of immersive presence while playing a computer game or seeing a movie clip. The assumption behind using visual and

tactile adjustable distraction was the paradigm that 'presence is as strong as the minimum amount of stimuli required to break it' (Nordahl & Korsgaard 2009: 175).

Subjective measure of Immersion: Questionnaire development

The comparison of the two immersion/engagement scales as developed by Jennett *et al* 2008 and Busselle & Bilandzic (2009), led to use of the latter for the measurement of immersion experienced by the participants in the two storytelling interfaces as it was specific to the measurement of narrative engagement. However, I have also included a few items that were applicable in a narrative context from Jennett *et al's* questionnaire for game immersion. Engagement has been taken here as synonymous to immersion, as both the studies mention them interchangeably within their definitions.

The 12 items in the narrative engagement scale as developed by Busselle & Bilandzic (2009) fall under the four subscales of 'narrative understanding', 'attentional focus', 'narrative presence' and 'emotional engagement' and each subscale has three items (Table 7). However, the word 'program' in some of the items has been replaced by the word 'story' as the scale has been developed to be used flexibly for any narrative experience ranging from TV program to movies or short stories. In keeping with the norms for such scales, participants were asked to agree or disagree on a five point scale for each of the items, where 1 was for strongly disagree and 5 was for strongly agree.

1.Subscale for Narrative understanding	At points, I had a hard time making sense of what was going on in the story.
2.Subscale for Narrative understanding	My understanding of the characters is unclear
3.Subscale for Narrative understanding	I had a hard time recognizing the thread of the story.
4.Subscale for Attentional Focus	I found my mind wandering while the narration of the story was on.
5.Subscale for Attentional Focus	While the story was on I found myself thinking about other things.
6.Subscale for Attentional Focus	I had a hard time keeping my mind on the story
7.Subscale for Narrative Presence	During the story narration, my body was in the room, but my mind was inside the world created by the story.
8.Subscale for Narrative Presence	The story created for a brief time the fantasy world of horror, and then that world suddenly disappeared when the narration ended
9.Subscale for Narrative Presence	At times during the narration, the story world was closer to me than the real world.
10. Subscale for emotional engagement.	The story excerpt affected me emotionally to the extent that I could feel the tension in the situation.
11. Subscale for emotional engagement.	During the story narration, when the main character succeeded in escaping narrowly from the clutches of Dracula, I felt relieved.
12. Subscale for emotional engagement.	I identified with the situation of the protagonist in the story and would have felt the same kind of uneasiness in the eerie situation.

Table 7: 12 items adapted from Narrative Engagement Scale (Busselle & Bilandzic 2009)

13. I was unaware of what was happening around me

14. I was aware of the surroundings

15. I felt detached from the outside world for the short time of the narration

16. I still felt attached to the real world outside the story narration

17. I would have liked it if the narration continued further for some more time.

18. The story session was interactive

19. I like storytelling or reading to be always interactive.

20. I was not distracted at all by the surrounding noise while the narration was going on

21. There was a distracting visual on the computer screen that distracted me from listening to the story at one point.

Table 8: 8 adapted items (Jennett et al 2008) with a similar scale of agree-disagree as Items 1-12

22. What did the man look for in order to stop the cut from bleeding?

23. Where did the shaving glass fall after it was thrown out?

24. Did you notice a gorilla during the storytelling session?

25. Did you notice a man wearing a black coat walking across in the background?

26. I think the narration of the story excerpt lasted for approximately (You can mark anywhere in between the options).

    1min---------2min-----------3min------------4min-------------5 min--------6min

27. How immersed in the whole story did you feel while you listened to this short excerpt from Dracula?

    0-----1------2------3------4------5-----6------7------8-----9-----10

            0—not immersed   10- very immersed

28. If you noticed the gorilla, how distracted did you feel by the gorilla?

    0-----1------2------3------4------5-----6------7------8-----9-----10

            0—not distracted   10- very much distracted

29. If you noticed the man walking by in the black coat, how distracted did you feel?

    0-----1------2------3------4------5-----6------7------8-----9-----10

            0—not distracted   10- very much distracted

Table 9: 8 items for gauging story comprehension and self-reporting of immersion and distraction

Apart from these 12 items in the questionnaire, I used 8 items (see in Table 8) that were adapted from the immersion questionnaires used by Jennett et al (2008). Items 21 to 29 (see in Table 9) were created to collect additional data for further analysis. There were 4 open ended questions (items 22 to 25) that were asked to test the participant's retrospective comprehension and memory about the specific details in the story. There was one item (no.26) that was created to test the participant's retrospective estimate of the time for which the story was narrated. The

choice was given on a continuous scale that ran from 1 minute to 6 minutes to be estimated against an actual time of 3 minutes. This was based on earlier trials in a pilot that showed estimates to be within 2 minutes to 5 minutes. Such retrospective estimate of time has been commonly used in immersion research as a measure of immersion in games and online activities as it has been believed anecdotally that immersion is linked to time (Nordin et al 2013). This is reflected partially in common life phrases like 'time flies when you are having fun'. It has also been shown that increased immersion in a videogame tends to have significant effects on time perception (Sanders & Cairns 2010). I therefore attempted to investigate if there are similar effects of immersion in the context of oral storytelling on retrospective estimates of time and also use the data to explore if the presence or the absence of the oral storyteller does result in a significant difference in the retrospective time perception. There were three items at the end (number 27 to 29) which asked participants to self-report their overall sense of immersion and distraction felt due to the two potentially distracting items planted in the visual accompanying the storytelling. For these three items, the participants were asked to rate in a continuous scale ranging from 0-10, where 0 was for no immersion or distraction and 10 was for the highest level of immersion and distraction (respectively for the items).

Quantitative measure of immersion: Eye-tracking

To overcome the problems with subjective questionnaire measures of immersion as they rely on the subjective opinion of the participants (Slater 1999), use of objective measures have been advocated by Ijsselsteijn (2000). Subjective questionnaire measures also may lack a high degree of reliability due to the participants lacking 'a fair understanding of what is meant' (Jennett et al 2008: 644) by the terms 'immersion' or 'distraction' or failing to account for the differences in ratings arising out of differences in the understanding of these terms by the participants. Objective measures like eye-tracking depend on 'responses that are in general produced automatically and without much conscious deliberation' (Jennett *et al* 2008: 644) and therefore can act as a balancing factor to corroborate the data from the subjective measures.

Eye-tracking as a measure of immersion is based on the assumption that human gaze can be used to extract information about the user's intention and attention which also indicate the cognitive processes of the user at a given point of time (Toet 2006). Eye-tracking has been used to analyse the process of reading, paintings and films (Duchowski 2003). It has also been useful in studies related to people's perception of websites (Silva & Cox 2006), inattentional blindness (Koivisto *et al* 2004, Pappas et al 2005, Menmert 2006) and computer games (Jennett *et al* 2008). While eye-trackers measure eye-movements like saccades, fixations, blinks, and pupil dilation, my study used data regarding fixations and saccades. Saccades are rapid movements of the eye that redirects the eye from one fixation point to another. Fixations are the gaps between the saccades when the eye gaze remains static at a particular point. The difference between fixation and saccades also is in the fact that human beings take in information during fixations but are almost blind for all practical purposes during saccades (Land 2006).

As discussed earlier, in the section on the linkage between immersion and distraction, I have used visual distractions of two different kinds to compare the levels of immersion in the two different interfaces. In designing the item of distraction and its size, movement path, timing and location I used the study on un-expected objects and the phenomenon of inattentional blindness was used in the 'invisible gorilla' study (Simons & Chabris 1992). A static gorilla image that moved from right to left was used as the item of distraction in place of the gorilla that walked from the right to the left in the 'invisible gorilla' study. The dimensions of the unexpected object i.e. the static gorilla image were kept the same as the attended object (the 3D digital animated oral storyteller) following the original experiments on 'inattentional blindness' to 'unexpected objects' (Simon & Chabris 1992, Most et al 2000). The unexpected object which is supposed to be the object for distraction (in this case it is the static gorilla image) enters the frame of display and exits within a time frame of 5-8 seconds. This is in keeping with the time for which the unexpected objects stay in the display for 'invisible gorilla' videos or in related experiments. The location of the unexpected object has been 'found to play at least some role' in the possibility of its detection and therefore in its ability to distract the observer (Most et al 2002, Mack & Rock 1998) from the attended object. It has been seen that the rate

of detection increases with the increasing closeness of the unexpected object to the zone of attention. Therefore, in this study, I made the gorilla move from the extreme right to the extreme left in a manner that the unexpected unrelated image of the gorilla moved in progressively from the potentially unattended zone (extreme right of the screen) to the potential zone of attention (the 3D virtual storyteller) and then again moved out towards the potentially unattended zone at the extreme left. This allows the distracting image to be there in both the potentially attended and unattended zone. For the observers in NO-AVATAR interface (only audio track and no 3D virtual story-teller) the gorilla image moves through the same path as the AVATAR interface (audio track with 3D storyteller). Other than the moving static image of gorilla, I also incorporated a more subtle distraction in the form of a walking man in a black coat in the background visual behind the 3D digital animated oral storyteller. In terms of proportional representation of distance in the virtual background, the walking man is at a distance of approximately 150 meters from the foreground and the size of the man is in congruence with the virtual distance. The interface without the AVATAR also has the same distraction of the walking man. These two potential distractions however appear at different points of time during the running of the narrative. The assumption behind using two different kinds of distractions, was that this would give me a broader set of data on the reaction of participants and also capture the potential differences if any between different types of distractions.

The other objective measure for tracking levels of immersion is based on the relationship between fixation duration and immersion. Fixation data is given in two forms: fixation duration and number of fixations. Toet (2006) suggests that a longer fixation duration is indicative of a longer amount of time spent in investigating, interpreting and processing a target. Fixation duration and number of fixations will be inversely related as fixation duration decreases with increasing number of fixation within a given period of time. I used the data for fixation duration in order to draw conclusions about the degree of immersion based on the findings of Styles (1997) and as applied by Jennett et al (2008) to predict that for an immersive task the fixation duration will increase with time as their attention becomes more and

more focused and for a non-immersive task the durations will stagnate or decrease as they become more distracted.

Hypothesis

With the ulterior motive of drawing conclusions about how the entities in a virtual application like the 3D virtual oral storytelling avatar influence or impact the act of listening to a story, the following hypotheses were set up for the experiment. It must be noted that proving or disproving of the hypothesis in itself is not the purpose of the experiment, but irrespective of the hypothesis being proved correct or incorrect, it is expected that the discussion around the results and the interface experience will reveal the intricacies of storytelling in the virtual culture.

> H1: The tendency to be distracted by unrelated visuals will be significantly different for those viewing the interface with 3D digitally animated (avatar) oral storyteller than for those viewing the audio-visual narration without the avatar.

> H2: Retrospective estimation of time will be significantly different for those viewing the interface with avatar oral storyteller than the ones viewing the audio-visual narration without the avatar oral storyteller.

> H3: Immersion in the story consumption will be significantly different for those viewing the interface with avatar oral storyteller than for the ones viewing the audio-visual narration without the avatar oral storyteller.

The Development Phase: Debates, Subjectivity and Theoretical Perspectives

The final design of the interface and the experimental set-up was obviously not reached without its own set of situations where subjective or collective wisdom prevailed over any rationale provided by any individual or a definite theory. At the point of time when designers are in the vortex of such situations mired in subjectivity, they rarely fall back on a theoretical framework to rationalise or find a solution. I was no different. However, much after those situations have been resolved, I find it valuable to chronicle the debate around one such situation that centred on the most essential element of the interface, the 3D oral storyteller, and retrospectively attempt to view it through relevant theoretical frameworks.

The choice of the embodied agent who will play the role of 3D oral storyteller involved the choice of gender and his/her physical features and the decision was left

to the software developers. At that point of time, the choice did not seem to be of a great consequence to the outcome of the project and was more guided by the budget for buying assets from the Unity Asset Store and also from the options that were available in the store. The choice they made was of a young woman whose facial features and complexion was kept neutral in race or ethnicity as far as possible. The following pictures of the development phases of the avatar (picked up from the undergraduates' project submission) gives the reader an idea of the process of avatar development and the subjectivity involved in creating its physical features or appropriate outfits.
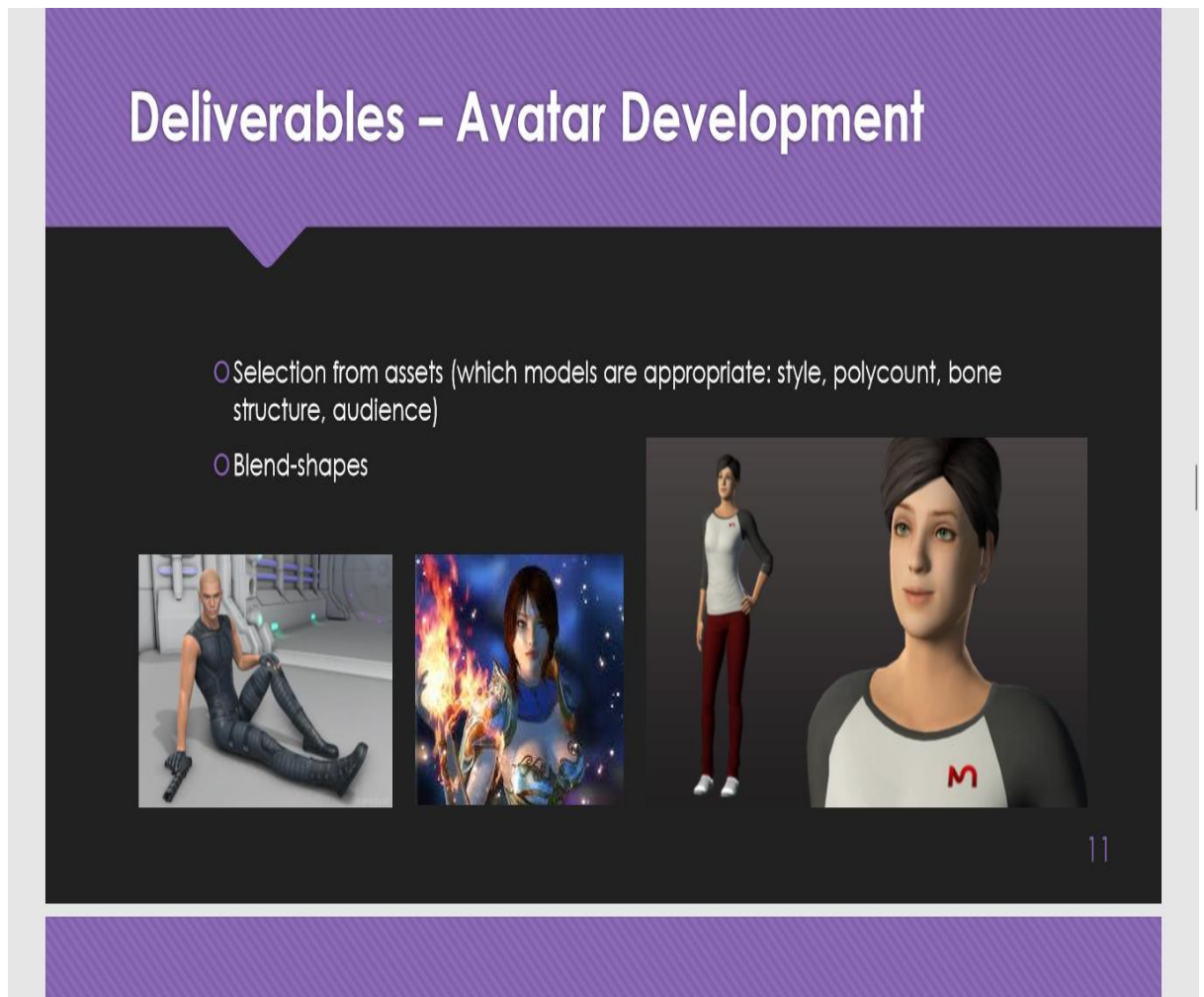
Figure 15 : Samples of embodied Agents in the Unity Asset Store
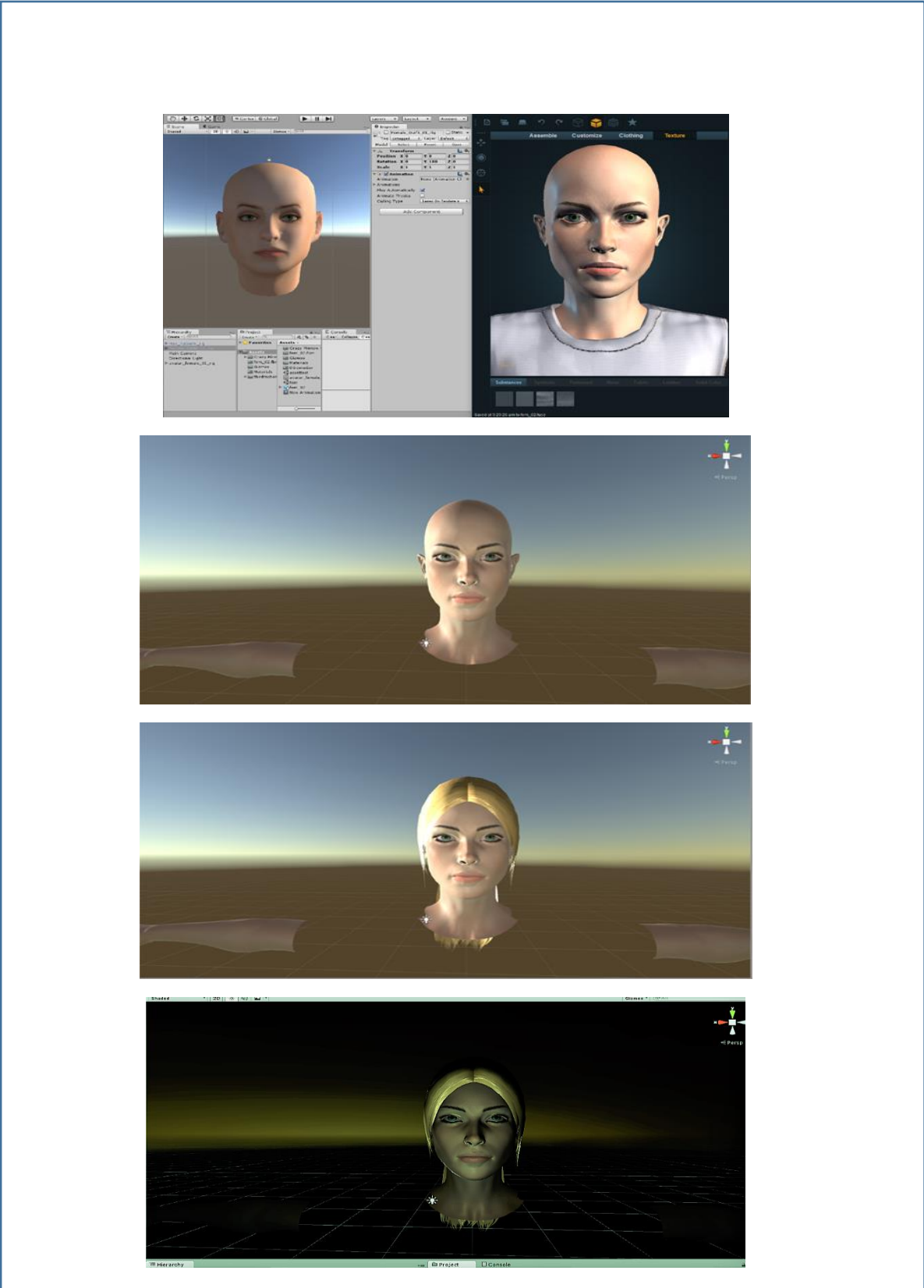
Figure 16: The Stages of Avatar Development from Product Development Dossier

Figure 17: The Avatar version with a deeper cleavage (that was later edited)

While the software developers, who were both young male students, did not find anything objectionable regarding the choice of the avatar or her outfits and were confident about their choices within the given financial and technological constraints, the project supervisor and I pointed out the deep cleavage display and the apparently overt sexuality of the avatar as being improper for the given situation or experiment. In fact, my concern was more for the fact that this apparent sexualization of the avatar might prove to be a kind of obvious distraction that may grossly impact the results of the experiment. This view of ours to a certain extent was reflected during a pilot exercise by the informal feedback from independent observers. Quoting from the interview and post-experiment discussion conducted with the software developers, one of them recollected '*A lot of people said because she's a female avatar and it's an adult – that's kind of adult content story, so it's a vampire story, not really for kids. A lot of people were saying maybe we would have*

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a distraction if you look down like at her cleavage level.' To be objective about the nature of the feedback, I must state that there was a significant section of the people who saw the avatar in the developmental phase and did not consciously think about the sexuality of the avatar. This section of viewers were perhaps more concerned about the functional features of the avatar like head movement, gaze and lip-sync problems or avoided direct reference to the sexuality of the avatar. Though the software developers stuck to their opinion that the depiction of the female avatar was not gross as per their sensibility and cultural values, they paid heed to the criticism and decided to cover up the cleavage display of the female avatar as far as possible in the final stages of the development. This will be apparent to you as you compare the avatar in the developmental phase with the avatar in the final interface. Retrospectively, I however realize that I could have intervened more constructively in the choice of the avatar asset and her physical parameters at the very initial phase of the development and thereby avoided much of this incident at a later stage.

Irrespective of the specifics of the avatar development in this particular project and the debate around how it panned out, the narration of this anecdotal piece of information leads us to some extremely relevant theoretical connections in the process of a technology interface building exercise. One theoretical relevance is the idea of 'social constructivism' which points to the phenomenon of a technology being perceived by multiple stakeholders in diverse ways and it is these diverse perceptions that feed into the continuous development process of a particular technology. Bijker (1995) specifically gives the examples of how the bicycle as a whole and also its constituent parts like the tyre were viewed by different users - the racers had concerns about speed, the general users appreciated its convenience and stability, while the producers were more focused on the economic implications. The experience with the avatar development resonates with Bijker's social constructivist idea that "Relevant social groups do not simply see different aspects of one artifact. The meaning given by a relevant social group actually constitutes the artifact' (Bijker1995: 77). The illustration below as used by Bijker in his publication illustrates the diversity of bicycle designs arising out of diverse preferences and its implications for the design process.

Figure 19-All Shapes and Sizes (artwork by Andy Singer)

Figure 18: The diversity of bicycle designs

Source : Bijker (1995)

This is a testimony to the fact that the 3D storytelling avatar could also have shaped up in different ways if the controlling factors like the choices made by the software developers, the financial constraints or my personal involvement in the choice of the particular asset would have been at a higher level.

The debate around the sexualization of the female avatar as it panned out in this project can also be seen through the lens of the feminist theory of 'male gaze'. Feminist film critic Laura Mulvey way back in 1975 in her seminal essay titled "*Visual Pleasure and Narrative Cinema*" posited the idea that female characters are represented in Hollywood films as objects for the 'male gaze'. Mulvey's original argument that gender power asymmetry acts as a decisive force in cinema and either consciously or subconsciously results in the way characters are presented or made to act in the films could be significantly applicable for digitally animated productions too. It's significant to note that while characters and entities are 'virtual' in digitally animated productions, the three different looks that Mulvey talks about in her essay on films are potentially present in virtual world scenarios also. The look of the camera in real world is replaced by the virtual camera of the software that the digital animator uses at his/her will to create the scene in the virtual world. The voyeuristic act of the audience looking at the virtual female characters with the 'male gaze' or the 'male gaze' operating between the characters interacting with one

another are the other two possibilities whose potential is amply displayed by the avatar development anecdote. Though in the oral storytelling scenario there was no scope for the third category of looks where the characters interact with one another within the film, the situation was indicative of how Mulvey's argument that female characters in films are given an appearance that is coded for strong visual and erotic impact can go beyond the medium of film and be meaningful for the virtual culture. However, the nature of the gaze and the manner in which it operates may be quantitatively and qualitatively different for the virtual culture as opposed to earlier existing media. The scope for this research does not allow me to stretch beyond a brief discussion on the 'male gaze' as apparent in a virtual 3D avatar building scenario. However, it does open up the scope for further research related to the way 'male gaze' operates in the world of virtual culture, specifically in the development of digital interfaces.

Summarizing: From conceptual exploration to design

The chapter started off with the specification of the 'wickedness' involved in the design problem that focuses on 'immersion' and 'distraction' involved in the consumption of stories in a virtual culture through the medium of a 3D virtual oral storyteller. This experimental phase had the broad aim to do a comparative study between the immersive capabilities of an avatar and the alternative narration, without the presence of the avatar and the underlying goal was to tease out the typifying characteristics of the virtual culture through the experiment. I presented an initial prototype of a 3D digitally animated oral storyteller (avatar) with certain elementary quasi-human capabilities and measured the degree of immersion experienced by the user in comparison to the immersion experienced through an alternative narration without the avatar. Immersion has been gauged through objective measures including eye-tracking, and subjective measures (questionnaires). Veering away from the norms of designing the interface where the designer merely lays out an interface design based on some inputs culled from the potential users, the client or his/her own intuitive knowledge, I tried to rationalize my own choices or the inputs from the focus group/ survey through the lens of theories in the areas of media studies, design thinking and HCI. Medium theory, theory of

remediation and some historical examples of media interface development that reveal certain fixed patterns in media interface development were chronicled in context to their relevance in this development process. The implementation of the experimental set-up also drew inspiration from a combination of earlier experiments in the field of behavioural psychology and immersion studies in the field of digital media consumption. However, one of the most crucial facets in the description of this design phase in the project was the social-constructivist position that technology is borne out of multiple strains of thoughts and constraints that influence the technology designer and thereby impact the final design outcome. It should be noted that, although in going through this design process of remediation, I have made an effort to reflect on and accommodate relevant theories, prior research and examples, the results of the trial may point out the limitations of my discussions so far.

CHAPTER SEVEN

The Numbers say this Much

Towards the end of the last chapter, I had provided the set of hypotheses that would form the basis for interpreting the results and drawing certain conclusions. The rationale behind mentioning the complete set of hypotheses at the end of the complete description of prototype development and the experimental set-up (instead of at the beginning) is driven by the fact that in this study the proving or the disproving of the hypotheses is not the primary goal. They are just a means to explore certain facets of the virtual culture and give a direction to the interpretation of the data arising out of the development and usage of an interface that is an exercise in remediation. In the earlier chapters, I have partially explored through the focus groups and survey data the facets of how the cultural legacy of earlier media cultures combine with the characteristics of the emerging virtual culture to shape our expectations and responses towards new storytelling interfaces. The discussions around the results of the interface trial will be carried out in two parts. This chapter is devoted to the micro analysis of the interface trial results with respect to the hypotheses that have been framed around the constructs of immersion and distraction. The next chapter will carry forward the discussion to view the results from the macro perspective of remediation as a process, apply the lens of relevant theories from the field of media studies and design as discussed earlier in this dissertation and also explore the diverse factors that could have contributed to the results.

Hypotheses encore

I will reiterate the hypotheses once again in this chapter for easy reference while reading through the results and the discussions thereof.

H1: The tendency to be distracted by unrelated visuals will be significantly different for those viewing the interface with 3D digitally animated (avatar) oral storyteller than for those viewing the audio-visual narration without the oral storyteller.

H2: Retrospective estimation of time will be significantly different for those viewing the interface with avatar oral storyteller than the ones viewing the audio-visual narration without the avatar oral storyteller.

H3: Immersion in the story consumption will be significantly different for those viewing the interface with avatar oral storyteller than the ones viewing the audio-visual narration without the avatar oral storyteller.

Tobii Eye-tracking Software tools: Areas of Interest and Focal Duration

This section provides a brief explanation of the eye-tracking tool and its data capturing methodology for ensuring an ease of understanding the data analysis in the latter part of this chapter. Tobii Eye tracking data output and analysis software that comes along with the hardware provides diverse kind of data that is captured by the eye-tracker and also tools for carrying out customised analysis depending on the needs of the project. One of its functionalities allows us to extract the data for the total duration of time spent by an individual audience in gazing on any defined area of the computer screen that displays the interface. The defined area of interest for gaze is referred to as the 'areas of interest' (AOI) and the following images (screenshots of the computer screen) as given below in figure 1 will give an idea of how the AOIs were defined by me for analysis. There were four AOIs defined within the screen space: the gorilla, the avatar, the fire and the walking man in the background. The only point of difference between the AOIs in the two interfaces is that in the AVATAR interface (Figure 18), the AOI actually is around the avatar for the complete time of the narration, while in the NO-AVATAR interface (Figure 19) the AOI just works as a control (no avatar is actually there in that area).

It is also necessary at this stage to unpack the idea of 'gaze' and what constitutes it. Human gaze is primarily made up of 'sacchades' and 'fixations' (Jennett et al 2008). Saccades are the type of eye movement in which the fovea of the eye moves rapidly from one point of interest to another. A fixation (which is also called focus) is the period of time when the eye is kept focused on the target for a certain duration, allowing the eye to process the detail and send it to the brain. Our perception of any object that we see in real-time is a built by the eye alternating these sequences of fixations and saccades. Saccades being fast movements from one point to

another, the information uptake is poor and therefore most of our information uptake happens during the periods of fixations (Land 2006). In the Figure 20 and in Figure 21, you will see the circular patches that constitute the fixation and the straight lines joining these fixations are the sacchades when the eye moves from one point to another. When I talk about the total duration spent on a given AOI, it is the total time spent by the eye in 'sacchades' and 'fixations'. Please note that these AOIs were kept exactly the same in dimensions and location for the two interface without the 3D virtual oral storyteller (NO-AVATAR) to draw valid comparison between the two interfaces. In case of gorilla and the walker (objects that move across the screen), the AOIs move along with the objects to capture the total time spent on the AOIs. However, it needs to be mentioned for the purpose of clarity, that these AOIs were used as post-experiment analytical tools and were not visible in these forms to the participants. The captions (in while boxes) naming the AOIs and red-coloured arrows have been added to help the readers in locating the different AOIs.
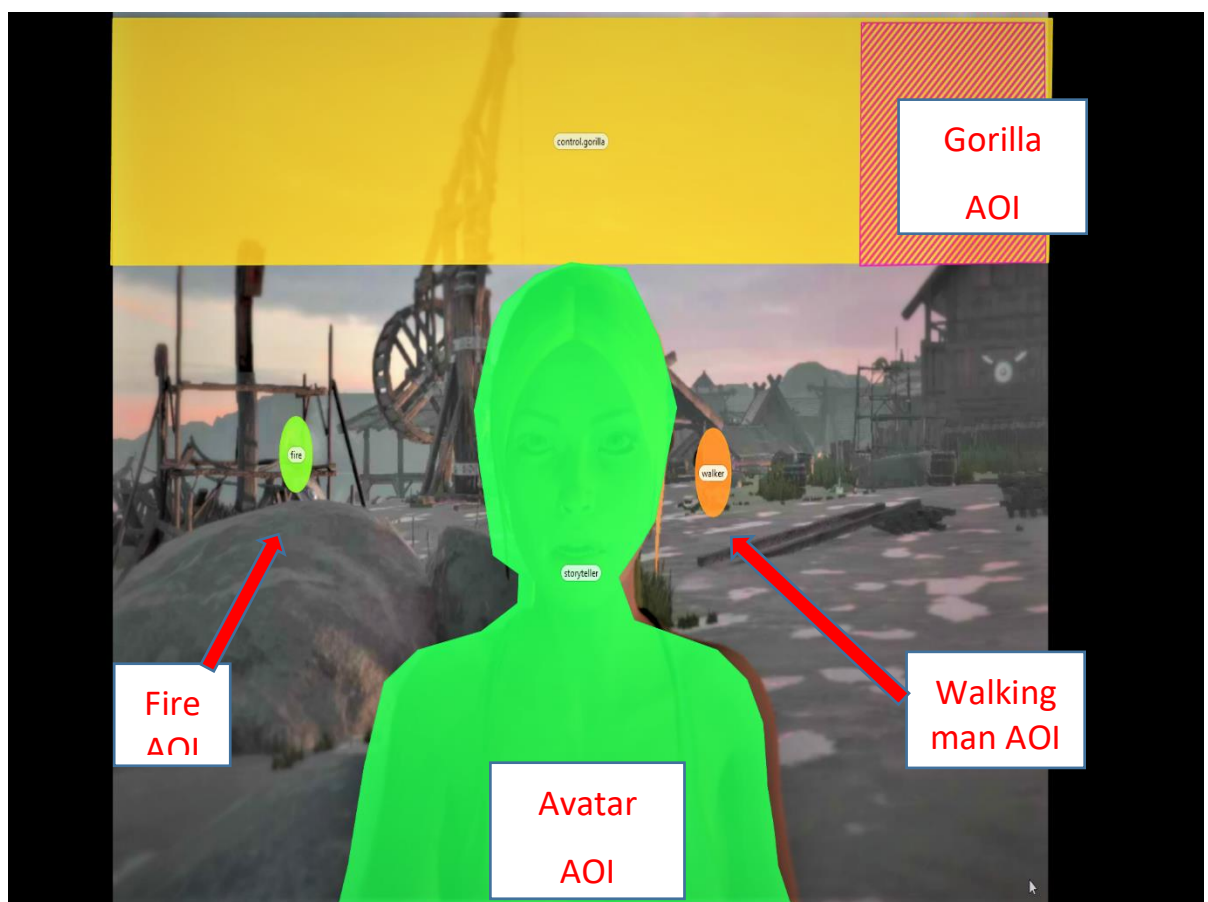
Figure 19: AOIs as defined for the storyteller, walker, fire and gorilla for AVATAR interface
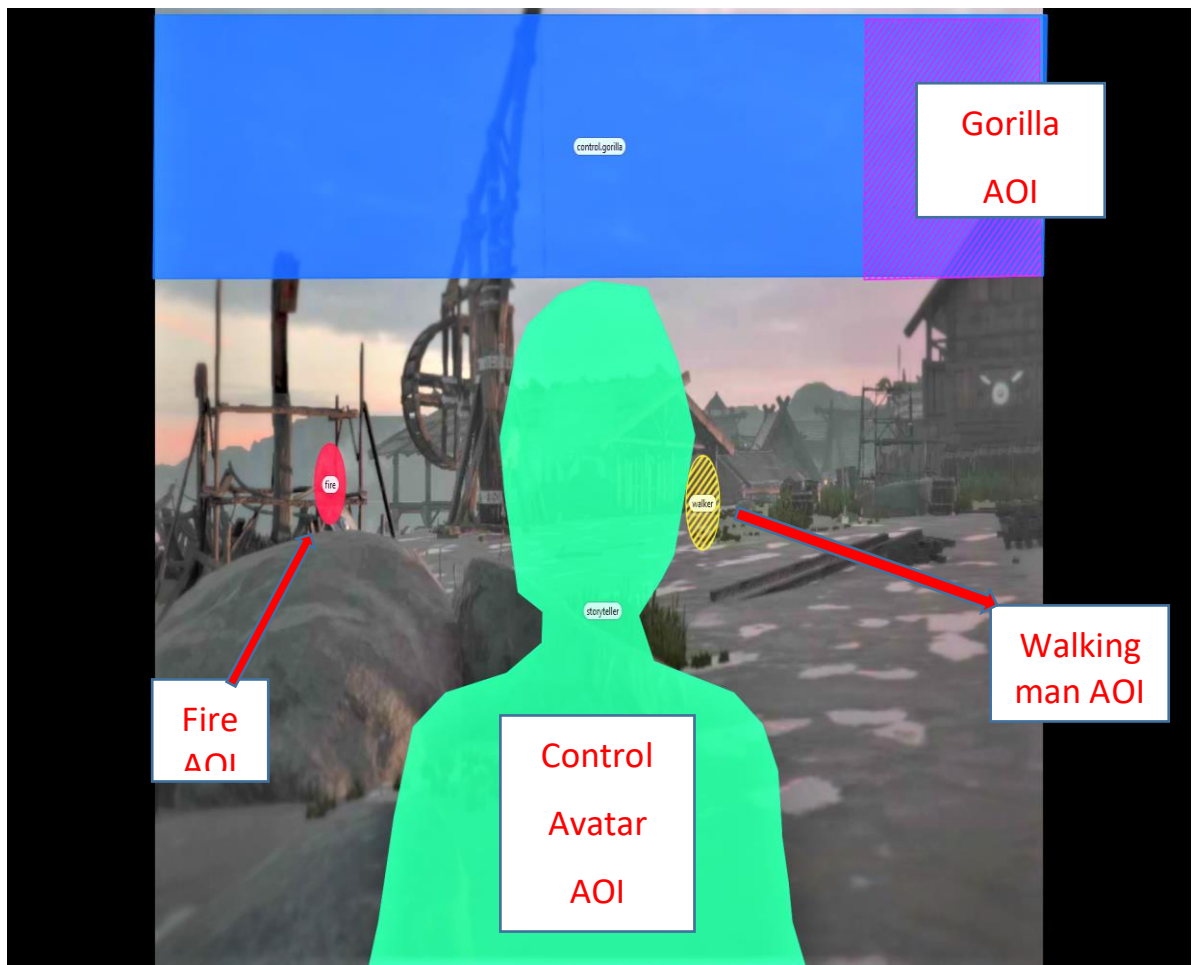
Figure 20: AOIs in the NO-AVATAR interface

The other functionality that I used from the Tobii eye-tracking software was extracting the data for each of the fixation durations for a given participant for the total length of time spent in listening to the narration. As discussed in the earlier chapter, increasing duration of focal fixations with progress of time is indicative of increasing immersion and vice versa. This is however an assumption that I am making based on the findings and conclusions of earlier research in the field of eye tracking and immersion. Figure 20 and Figure 21 are representative screenshots of how the eye-tracking software displays the gaze plots. While Figure 20 is representative of an AVATAR interface participant's gaze plot, Figure 21 is for a NO-AVATAR participant. The figures will give a sense of how the focal fixation durations keep changing over time and also how these two different interfaces (with or without the avatar) may bring about a change in the gaze and focal fixations. The

coloured bubbles that can be seen across different areas of the screen are indicative of the different duration of focus, with the size of the bubbles being directly proportional to the duration of focus around the centre of the respective bubble.
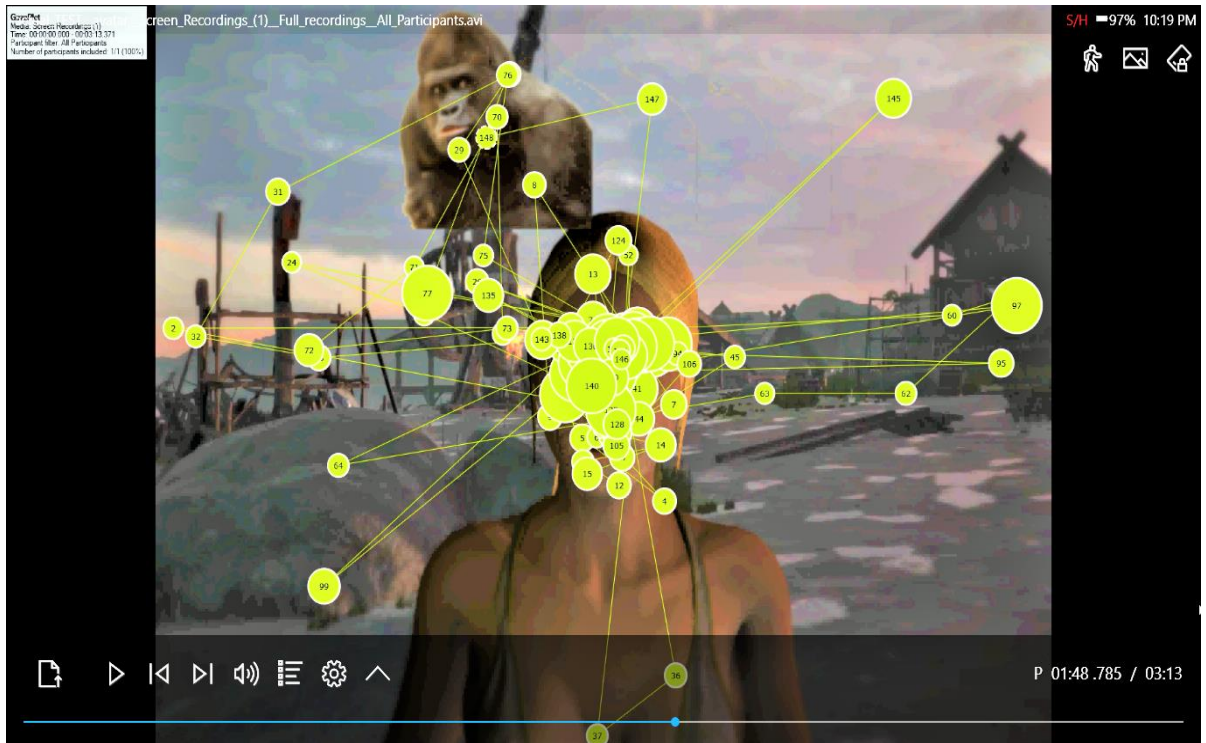
Figure 21: The Focal Fixation Plot for an AVATAR interface participant

Figure 22 : The Focal Fixation Plot for a NO-AVATAR interface participant

Results

The quantitative measures in the experiment were 'total time spent' by the participant on the different Areas of Interest (AOI), which were the oral storyteller and the two potential distractions in the form of gorilla and the walker. The total time refers to the cumulative total of focal duration and saccades of a participant within an AOI during the complete time of narration. A review of the gaze plots of participants revealed that apart from the two designated distractions that were consciously placed in the study, a majority of the participants across both groups spent a substantial amount of time gazing at the flickering flame in the background. There being a possibility that the flickering flame could also be a distraction for the participants, this element was also added to our list of distractions as an AOI for the purpose of analysis. In the case of the NO-AVATAR interface, an AOI that was the same in size and position as that of the AOI in the AVATAR interface was used as a control against the AVATAR interface which had the avatar in the same position. Drawing from the hypothesis, the mean of the duration of time spent looking at the potentially distracting items like gorilla, walker and the fire should be different between groups. Also apart from the hypotheses, there should be significant difference between the area of interest (AOI) around the oral storytelling AVATAR vis a vis the control area in the NO-AVATAR version to establish the basic fact that the participants gazing at the AVATAR was not a matter of coincidence. Two tailed independent measure t-tests were used in order to determine significance. Hypothesized mean difference between the two groups was always 'zero'. Statistical significance was set at $\alpha = .05$. This means that if the p value comes out to be equal to or less than .05 there is 5% or less chances for there being any real difference between the two groups and that will be accepted for this experiment to be a significant difference. On the contrary if p value is more than .05, the two groups represent no significant difference as far as the specific hypothesis is concerned. T-tests were run for the three different kinds of distractions individually and also for the total time spent by each participant on all the three distractions together. T test was also run for AOI defined around the AVATAR and the same AOI in the NO-AVATAR group where there was no virtual 3D AVATAR narrating the story.

Eye Gaze Data; Total Time spent on the Potential Distractions

On average, participants experiencing the storytelling interface without the oral storyteller (NO-AVATAR group), spent more time on Gorilla Mean (M) = 1.29 Standard Deviation (SD) =0.66 than those with the oral storyteller (AVATAR group) M= 0.96 SD=0.60. This difference =-0.33 was not significant t 27.7 = -1.45, p=0.157. However, it does represent a medium sized effect, d=0.53. Similarly, participants in NO-AVATAR group spent more time on the potential distraction of 'fire' M=2.99, SD=5.02 than the AVATAR group M=.975, SD=2.09. This difference of mean -2.01 was not significant, t 18.73 = -1.434, p=0.163. But there was again a medium sized effect with d= 0.52. For the potential distraction of 'walker', the average time spent on the AOI by the NO-AVATAR group M= 3.19, SD=2.50 was more than that spent by the AVATAR group of participants M= 1.37 SD=1.75. This difference of mean -1.82 was significant with t 25.13= -2.307 p=.03. The effect size was also large with d=0.84. When the total time spent on all the three potentially distracting AOIs together are compared, the mean for this total was again more for the NO-AVATAR group M=7.47 SD= 6.15 than the AVATAR group M=3.30, SD=3.687. The difference of mean -4.169 was significant with t 22.92 = -2.252 p=.034.

Distractions	AVATAR group Mean time (M) Seconds	NO-AVATAR group Mean Time (M) Seconds	p value
Gorilla	0.96	1.29	0.157
Fire	0.975	2.99	0.163
Walker	1.37	3.19	0.03*
Total Distraction	3.30	7.47	0.034*

Table 10: Key results for the time spent on distractions by the two Groups

*Significant p values (<.05)

Summary of findings

The means of the 'total time spent' by the participants on the three distraction items Gorilla, Walker and Fire individually were higher for the NO-AVATAR group than the AVATAR group. However, double tailed t-test results show that only the differences

in mean for the Walker and for the cumulative time spent on all the three potential distractions together are significant. The above results when looked at in totality may indicate that the tendency to get distracted would be less for the AVATAR group, supporting my first hypothesis. The conclusion about the hypothesis can be a conditional acceptance and not categorical, because the significant differences between the two groups comes out only because of the 'walker' and the other two potential distractions of gorilla and fire are not anywhere close to being statistically significant (though showing medium effect size).

Immersion as perceived through focal duration

Focal duration data for the total duration of the storytelling experience was captured for each of the participants. A Spearman's correlation was run for all of the participant's data against time. This was done in order to verify if the focal durations increased or decreased with progression of time. A positive significant correlation with time would indicate that focal durations showed an increasing trend over time. A negative significant correlation would indicate the opposite. Increasing focal duration as discussed earlier would indicate the increasing levels of immersion and the opposite would be true for progressively decreasing levels of focal duration (Jennett *et al* 2008). It can be seen from the Table 11 and the graphical presentation of the same (Figure 22) provided below that in the case of AVATAR group, 13 participants (except participant 1 and 9) show strongly significant positive correlation of focal duration over time. Essentially it means that the focal durations have kept increasing over time for these 13 participants. In comparison, only 7 participants in NO-AVATAR group (table 12 and Figure 23), show significant positive correlation of focal duration with time, 6 show significant negative correlation (indicating decreasing immersion with progress of time) and one each of positive and negative correlation are not significant. Figure 24 shows samples of the scatter plots for participants with increasing and decreasing focal durations with time.

Summary of findings:

According to the assumption that increasing 'focal duration' with time indicates increasing immersion over time (Toet 2006; Jennett et al 2008), 13 participants of AVATAR group can be assumed to have experienced increasing immersion over

time against 7 participants from the NO-AVATAR group experiencing the same. This finding bolsters the case for accepting hypothesis 3 (immersion experienced by the two groups should be different). For ease of visualizing the phenomenon of increasing and decreasing focal duration, you may refer to the scatter plot of participants who have showed increasing and decreasing focal duration respectively (Figure 7).

Participant	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
Spearman's ρ	-0.054	0.265	0.102	0.086	-0.339	0.623	0.086	0.283	0.081	0.159	0.197	0.221	0.137	0.441	0.018
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009

Table 11: Correlation Statistics for AVATAR group: 'focal duration' vs 'time'

AVATAR GROUP: CORRELATION OF FOCAL DURATION WITH TIME

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
■ Spearman's ρ	-0.054	0.265	0.102	0.086	-0.339	0.623	0.086	0.283	0.081	0.159	0.197	0.221	0.137	0.441	0.018
■ p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
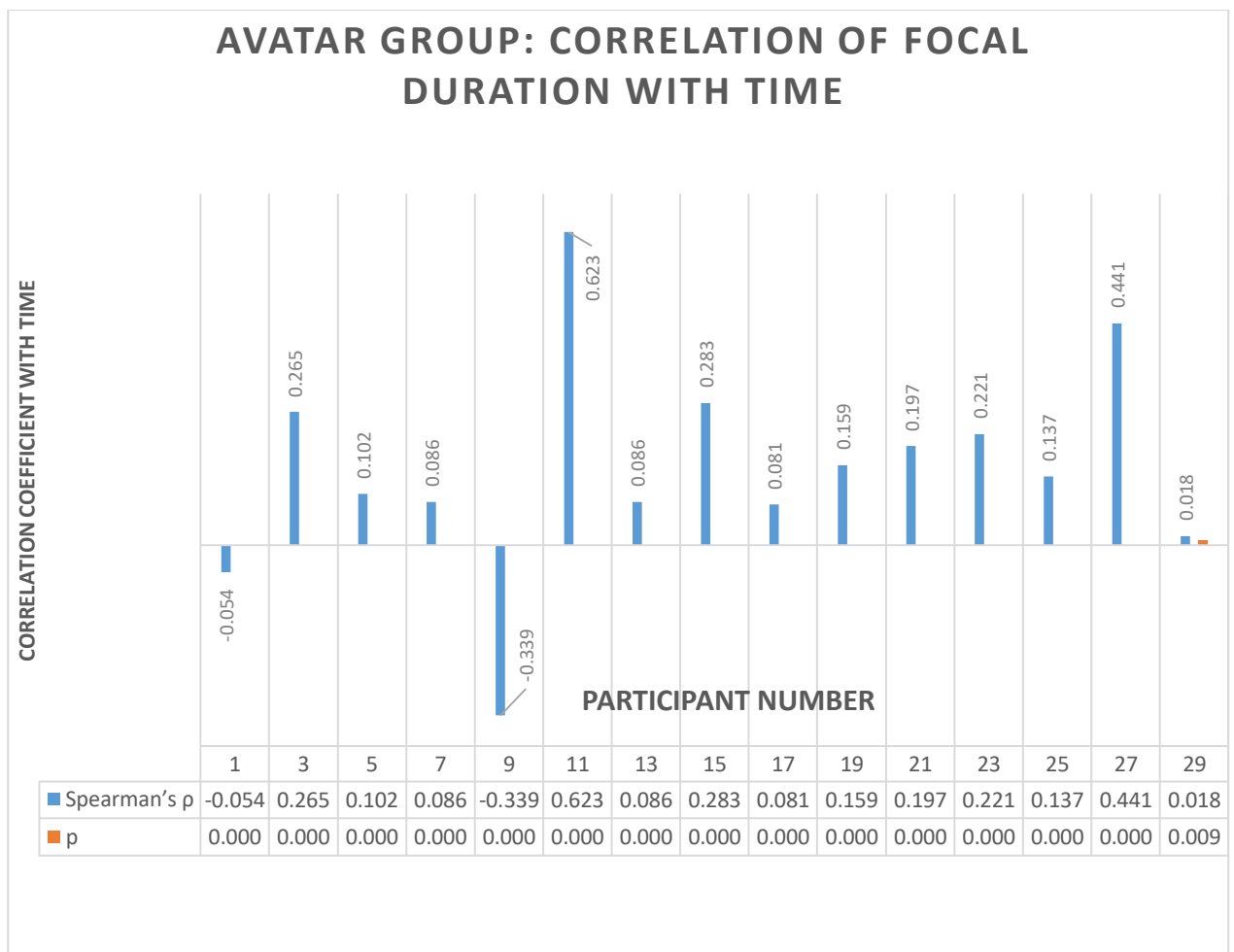
Figure 23: Correlation Statistics for AVATAR group: in graphical form: 'focal duration' vs 'time'

Participant	part02	part04	part06	part08	part10	part12	part14	part16	part18	part20	part22	part24	part26	part28	part30
Spearman's ρ	0.315	-0.00439	-0.105	0.273	0.116	0.166	-0.01119	-0.027	-0.128	-0.031	0.225	0.274	-0.21	0.01198	0.229
p	0.000	0.526	0.000	0.000	0.000	0.000	0.314	0.000	0.000	0.000	0.000	0.000	0.000	0.101	0.000

Table 12 Correlation Statistics for NO-AVATAR group: 'focal duration' vs 'time'

P values have been reported till 3 decimal places only
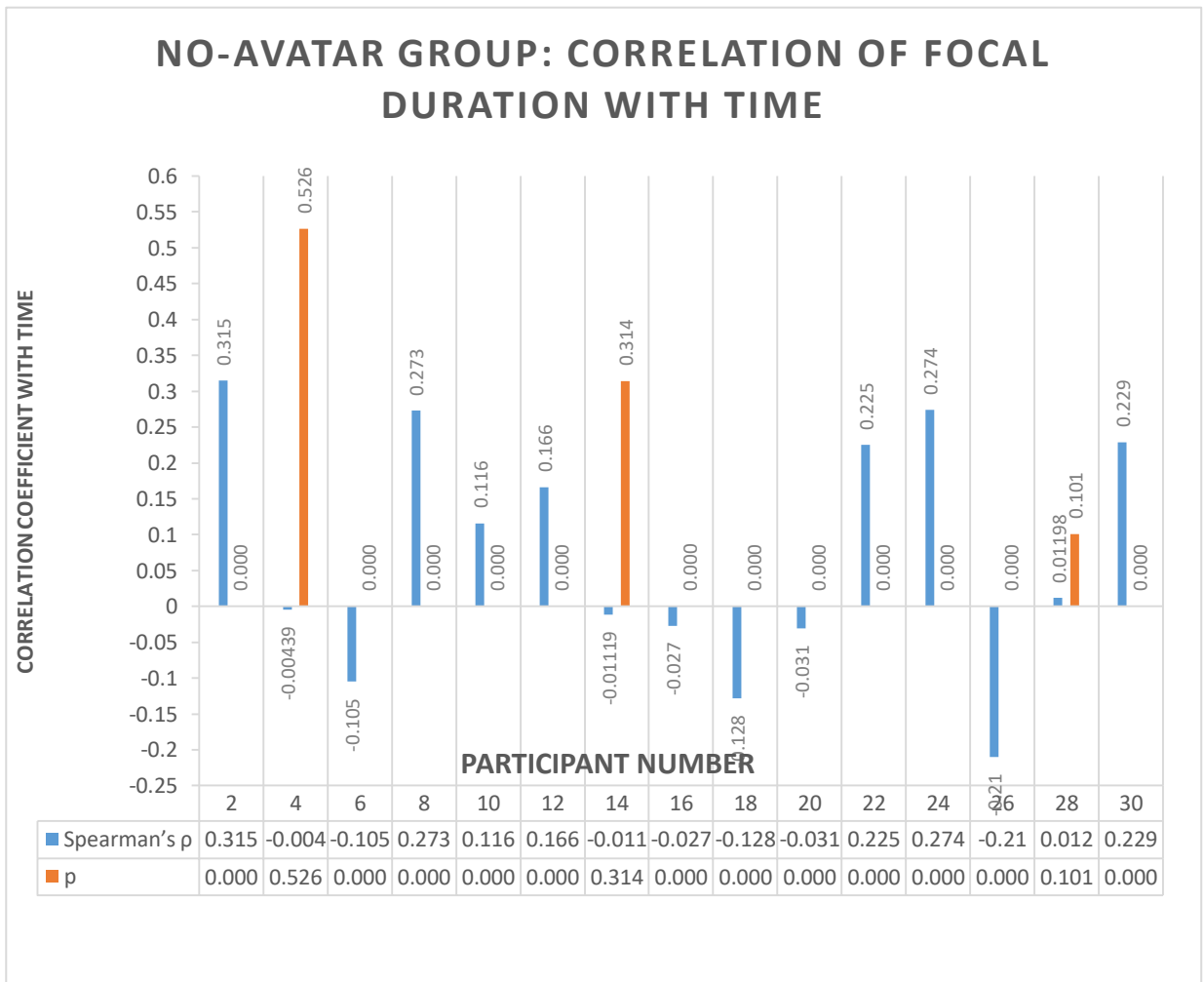
Figure 24 Correlation Statistics for NO-AVATAR group: in graphical form: 'focal duration' vs 'time'
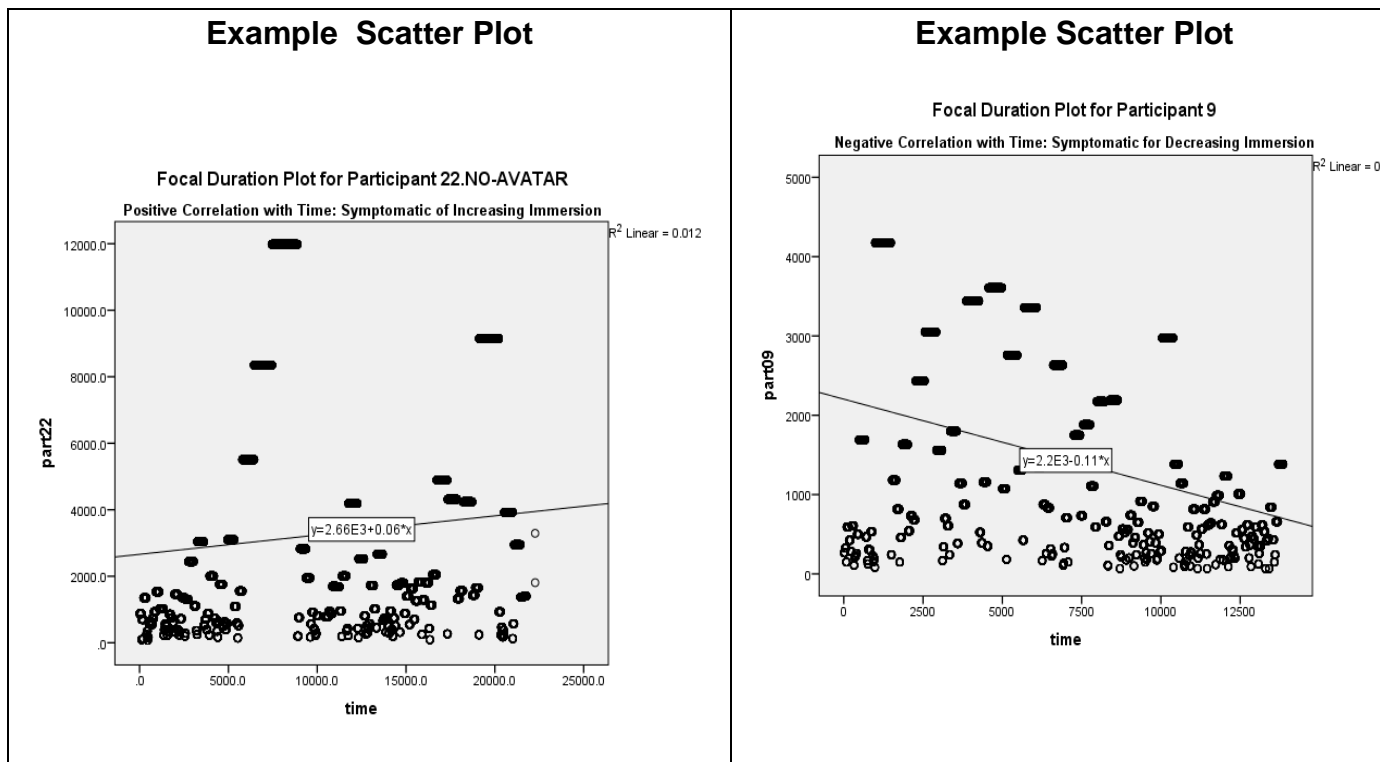
Figure 25: Sample Scatter Plot for participants with increasing and decreasing focal duration respectively

Immersion Questionnaire

Differences between two groups

In the post-test questionnaire, totals were calculated for the first 12 items in the post-test questionnaire (see CHAPTER SIX) that were modelled on the 'narrative engagement scale' as discussed in the earlier chapter. The immersion scores were based on 1 for strongly disagree to a 5 for strongly agree. Correspondingly, opposite values were given for negatively worded questions. The mean for the immersion or engagement as measured by the scale was found to be higher for the NO-AVATAR group M=38.933 SD=6.099 than the AVATAR group M=34.733 SD=7.77. As there was no requirement for the data from these subjective immersion questions to be normal, they were compared non-parametrically. The results however did not show any significant difference in immersion for the two groups Mann Whitney U=80.50, p=0.183. The scores for the 4 different subscales (narrative understanding,

attentional focus, narrative presence, emotional engagement) were then compared in a similar manner for the two groups and only the scores for the subscale of 'emotional engagement' was found to be significantly different Mann Whitney U=60, p=.029. The self-reported scores on immersion as experienced by a participant and the quantum of distraction as experienced due to the image of gorilla or the walker (measured on a scale of 10) were compared for the AVATAR and the NO-AVATAR group using Mann Whitney test. None of them showed significant difference (see Table 13).

However, comparison of the 'retrospective estimation of time' for the two groups shows that the mean time estimation for the AVATAR group and the NO-AVATAR group were 3.53 minutes and 4.34 minutes respectively. Both estimated a time higher than the actual time of 3 minutes. This difference though not within the acceptable significance value of p=<.05 tends towards significance U=69.50 and p=0.069 (see Table 13) and medium sized effect of r=.33. The mean ranks for AVATAR and NO-AVATAR groups were 12.63 and 18.37 respectively.

Questionnaire Scores	AVATAR group (Mean)	NO-AVATAR group (Mean)	Mann-Whitney (U)	2 tailed Significance(p)
12 item Immersion Score	34.73	38.931	80.50	0.183
Self-reported Immersion –Question 27	5.03	6.06	87.50	0.293
Self-reported Distraction (Gorilla)-Question 28	6.72	7	102	0.660
Self-reported Distraction (Walker)-Question 29	5.71	6.13	104	0.722
Self-reported Retrospective Time Estimate-Question 26	3.53 (minutes)	4.34 (minutes)	69.50	0.069*

*Table 13: Post-test Questionnaire Mean Scores and Key Results from Analysis for both groups *significance is at p<.05*

Summary of findings:

The immersion scores from the 12 item engagement scale was higher for the NO-AVATAR group than the AVATAR group, though not reaching the level of significant difference. The self-reported immersion score was also higher for the NO-AVATAR group than the AVATAR group, but not significantly different. The self-reported distraction rating for both the 'gorilla' and the 'walker' was higher for the NO-AVATAR group than the AVATAR group, but again not reaching the level of significance. However, retrospective estimation of time that was lower for the AVATAR group tended towards significance. The results give contradictory positions in the context of hypothesis 3 (there should be significant difference in immersion). The scores for the 12 item immersion scale and the self-reported immersion score not being significantly different for the two groups provides support for the rejection of hypothesis 3. The self-reported score for both the distractions being not significantly different for the two groups provides support for rejection of hypothesis 1. The retrospective estimation of time being lower for the AVATAR group and tending towards significance supports a conditional acceptance of hypothesis 2 (retrospective estimation of time should be different for the two groups). The lower time estimates of time by the AVATAR group also indirectly supports the acceptance of hypothesis 3 as a lower estimate of time signifies higher immersion for the AVATAR group.

Correlation between the 12 item engagement score and the other self-reported variables

To get further insights into these results, it was necessary to see the degree to which the self-reported scores for the different ranked variables like immersion, distraction scores for gorilla and walker and the retrospective time perception were interconnected within themselves. Statistically, this can be checked by looking at the degree to which they are correlated. A high correlation indicates that there was less of randomness and more of consistency and reliability in the way the participants gave scores for the different variables. This was done by running a Spearman's rank correlation between all of these self-reported values and will be discussed in the next section.

As all the variables of narrative engagement scale, retrospective time perception, self-reported immersion and distractions were directly or indirectly linked to immersion experienced by the participants in both the groups, a Spearman's rank-order correlation was run to determine any significant relationships between these variables.

First of all, 'retrospective time estimate' shows a very strong significant positive correlation with the '12 item immersion score' Spearman's ρ= 0.398 p=.030 and the single question 'self-reported value of immersion' ρ= 0.571, p=.001. This indicates a high degree of reliability of the responses of the participants and also their interconnectedness. The positive correlation value between time estimate and the immersion scores in both the cases would mean that with increasing immersion participants would tend to estimate a higher value of the time spent in viewing the media. What makes it interesting is that this is contradictory to the generally held belief that with increasing degrees of immersion retrospective time perception tends to be lower than the actual value.

The other very strongly significant positive correlation was between the '12 item immersion score' from the engagement scale and 'self-reported immersion score' ρ= .621, p=.000 signifying the reliability of the responses from both the measures. The negative correlation between the '12 item immersion score' and the 'self- reported distraction score' for Gorilla was also extremely significant with ρ= - .504, p=.005, indicating the fact that the 'gorilla' was perceived as a distraction that reduced the perception of immersion. However, surprisingly no such significant correlation was observed for 'self-reported distraction score' for the Walker with either '12 item immersion score' or 'self-reported immersion score' ρ= -.255, p=0.174 indicating the possibility that the walker was not perceived as a distraction that worked against the experience of immersion. It also indicates the possibility that there is a high degree of randomness in the manner in which the 'walker' was perceived by the participants.

Correlation between the Objective measure and Subjective measure

In order to explore if the data from the objective measure of eye-tracking for 'the total time spent' on distracting AOIs like 'gorilla' and 'walker' actually have a

relationship with the scores of immersion and distraction from the subjective measure of the post-study questionnaire, Spearman's Rank correlation was run on the variables for both the groups together. Only the self-reported distraction score for Gorilla was found to have a strong significant correlation with the actual eye gaze data of 'total time spent' on the Gorilla image ρ= .377, p=.04. This again indicates the high degree of reliability of the participants' perception of 'gorilla' as a distraction which is substantiated by the actual gaze behaviour towards the 'gorilla'.

Discussion

The data analysis from the eye-tracking and the questionnaires and their respective impact on the acceptance or rejection of the hypotheses have so far been laid out in the earlier sections. It can be observed by looking at the results in totality, none of the three hypotheses that hinge on the variables of distraction, retrospective time perception and immersion can be accepted conclusively. This is primarily because of contradictory results arising out of the different measures of these variables which cannot be reconciled at this point to give a categorical acceptance or rejection of the hypotheses. However, as stated in earlier chapters, the aim of the hypotheses testing through the interface has been to fundamentally expose these anomalies and assumptions in the process of remediation that may arise out of the results and offer alternative explanations for them. This discussion hereafter is focused individually on each of the three hypothesis that hinge on the variables of distraction, retrospective time perception and immersion respectively.

Hypothesis 1: Distraction

The data from the quantitative measure of eye-tracking does not reveal significant differences between the two groups for all the three potential items of distraction, though it is significant when all the three items (gorilla, walker and the fire) are considered together and also individually for the 'walker'. If I now consider the self-reported distraction ratings from the narrative engagement scale questionnaire data, there is also no significant difference or effect for the two groups on the variable of distraction by the gorilla or the walking man. Therefore, hypothesis 1 (H1) stating that the tendency to get distracted by visuals unrelated to the narrative will be significantly different for the two groups (p<.05) stands rejected in view of the

inconsistency of the results arising out of both the measures. However, if the strict criterion of significance (p<.05) is overlooked and I have a broader frame of observation, there are other interesting facets around the variable of distraction that deserve a discussion.

The self-reported scores on question 28 and question 29 in the subjective questionnaire show that both 'gorilla' and 'walker' are to a certain degree perceived as distractions by the participants from both the groups. This is apparent from the scores in the self-reporting where participants are asked to grade their feeling of distraction in the scale of 10 (1 standing for 'not distracted' and 10 for 'very much distracted). The mean scores for gorilla and the walker are 6.7, 7 & 5.7, 6.13 respectively for the AVATAR and the NO-AVATAR group (see Table 13). Though the self-reported figures show that the tendency to get distracted is more for the NO-AVATAR group for both the items, they do not reach statistical significance (p<.05). However, what needs a further discussion is the fact that the gorilla gets a higher score than the 'walker' in the self-reported score of distraction from both the groups signifying higher level of perceived distraction than the walker. When I add to this the fact that the self-reported distraction rating for 'gorilla' is the only variable whose scores correlate highly with the other self-reported variables as well as the eye-gaze data from the eye-tracker, the 'gorilla' turns out to be a consistent and reliable entity that caused distraction across both the groups. Though there is no objectively verifiable reason, this can probably be explained by the difference in the nature of the distraction as gauged from the post-test reactions from a significant number of the participants. Participants from both the groups felt that the moving photograph of the 'gorilla' was so direct and unrelated in the virtual animated context that they realized soon that it was not worth paying attention. To quote from the reaction of one of the participants in a post-test verbal reaction 'It was too much on the face and did not make sense…so I glanced at it and then looked away'. This pattern of reactions was similar across both groups.

However, the same was not the case with the 'walker' who was part of the realistic virtual background. Participants in the NO-AVATAR group probably paid specific attention to the 'walker' as for them the complete background was open to interpretation and as one of them pointed out 'I followed the walker as I thought

maybe he would do something, though I knew that this is a Dracula story and the walker was not making any direct sense, yet I was not sure…expected something to happen with the walker'. Similar unsolicited reactions came from 7 participants in the NOAVATAR group. One of the participants in the NO-AVATAR group also revealed the fact that he would not have seen the walking man as an agent for some sudden dramatic action if the same background was in the real physical world or he/she was listening to the Dracula story through headphones or speakers in a similar real-life outdoor setting. This is because he/she would then perceive the man walking to be real and a real human being in such a setting could not be expected to do anything dramatic or beyond normal human capabilities. Though this was a singular unsolicited response, it does point towards an extremely potent area of future study where virtual reality elements can be perceived as potential agents for dramatic action even if they are set in a realistic setting with no prior context for its dramatic potential or connection with the narrative being delivered. Two participants from the AVATAR group also did give very similar views in their post-test conversations about the walker being perceived as a potential element related to the story.

But the difference between the two groups was primarily in the lower tendency of the AVATAR group participants to look at the gorilla, walker or the fire as distractions, (as seen from the mean total focal durations), though not statistically significant for gorilla and the fire. This can logically be attributed to the defined storyteller in the foreground that dominated the AVATAR screen space unlike the NO-AVATAR interface where the background was the only context for the story being narrated. One of the post-test comments from the AVATAR group participant indicates such a possibility: 'I tried to look at the storyteller as much as possible…did get distracted by the gorilla and the walking man ..but realized that they don't make sense in the story …so came back to the storyteller almost immediately'. The eye-tracking figures are supportive of this behaviour as the mean time of total focal duration on the female storytelling AVATAR was 122.3 seconds (SD=48.53). The comparable figures for a control AOI in the same location of the NO-AVATAR interface is M=67.23 seconds, SD= 30.13. This difference in mean of 54.81 seconds was highly significant t 23.39= 3.71 p=.001.

There are two useful pointers that I find useful to cull out from the above discussion on the distractions. Though these pointers lack the statistical robustness due to the lack of richer data in this study, they are none the less useful considerations for future research or initiatives in remediating real-life oral storytellers onto digital interfaces through virtual characters and backgrounds.

- The discussion points towards the need for having a more refined definition of 'distractions' in a storytelling scenario where virtual characters or backgrounds are used. While the participants may spend time gazing on a particular object that in a conventional sense is meant to be a distraction, the total focal duration (as extracted from eye-tracking) may not necessarily translate into their self-reporting of the object as a distraction in a proportionate manner. This possibly happens because every virtual element within the screen can be viewed as a possible agent for action that is some way related to the story being narrated.

- This tendency of trying to discover contextual connections of any virtual element with the story (even if not so desired by the designer) can be reduced by the presence of a virtual avatar whose presence and narration has an impact on the tendency. However, the degree of the impact that the virtual oral storyteller has on the participants may be dependent on several other possible factors that will be looked at through theoretical frameworks in the next chapter.

Hypothesis 2: Retrospective perception of time

The mean retrospective perception of time is higher in case of the NO-AVATAR group and tends to reach the level of significance (U=69.50, P=.069 and effect size r=.33). It therefore comes close to supporting my second hypothesis that retrospective time estimates will be different for the two groups. However, If I try to explain the reasons behind the phenomenon, there are a few anomalies that can be observed and therefore need further investigation. From conventional ways of looking at it or drawing from earlier studies on computer game immersion (discussed in earlier chapter), the higher time estimate can be seen as a heightened sense of boredom or lower level of immersion than in the AVATAR group. But this

can be contradicting the fact that self-reported immersion scores in the same questionnaire had a higher mean (though not reaching statistical significance) for the NO-AVATAR group and they also correlated significantly and positively with each other. This means that with higher levels of immersion there would be higher estimates of retrospective time in this particular scenario which clearly contradicts the assumption based on conventional beliefs where individuals tend to have a lower estimate of time elapsed when they have a higher degree of immersion.

Looking at an alternative explanation for the same phenomenon, it can also be seen as a possible 'dissociation between immersion and time perception' as reported by Nordin et al (2013). Drawing from this lack of association between time perception and immersion as reported by Nordin et al (2013) is the possibility that the participants in the NO-AVATAR group possibly found the background that is virtually animated as a complex stimuli where they struggled to find contextual connections of the background elements to the story. Unlike the AVATAR interface where the 3D virtual oral storyteller gave a central sticking point to the story narration, this constant effort to discover contextual connections by the participants in the NO-AVATAR interface gave 'more memories for retrospective judgements to attach to' and hence a higher estimate of time (Sanders & Cairns 2010: 161). Though this may be interpreted as higher immersion in a gaming scenario as indicated by Nordin et al (2013) and (Sanders & Cairns (2010), it is not significantly evident if a higher retrospective estimate of time would mean a higher degree of immersion in a storytelling scenario with virtual entities. This analysis on the retrospective perception of time therefore creates ample opportunities for researchers to question the assumptions conventionally made about the inverse relationships between immersion and retrospective perception of time.

Hypothesis 3: Immersion

The third hypothesis, that levels of immersion will be different for the participants in the two different interfaces can only have a conditional acceptance due to some of the contradictory or irreconcilable results coming from these two different measures of eye-tracking and the self-reported immersion questionnaire. However, laying out these contradictions and limitations within the data analysis serves the important purpose of exposing the wickedness in this remediation process and its evaluation. I

will discuss the results around this hypothesis from three different parameters that were supposed to indicate immersion: *Distraction* from the unrelated items, *Focal duration* changing over time and *retrospective estimate of time*.

If I assume that the tendency to get distracted by unrelated visuals are truly indicative of the levels of immersion as suggested by the mental models approach on immersion or engagement (Busselle & Bilandzic 2009) and earlier research (Nordahl & Korsgaard 2009), then the results from the eye-tracker as discussed earlier are indicative of immersion being higher for the interface with the oral storyteller. This is because the participants of the AVATAR group have been significantly less distracted by the unrelated visuals if I consider the total time spent on all the distractions together and for the item of 'walker'. However, the fact that this difference does not reach statistical significance for the gorilla or the fire makes it a weak case for a categorical acceptance of the hypothesis. This is more so because the 'gorilla' is the only item of distraction that showed reliability as an item of distraction (as discussed earlier) and it also gets a higher mean rating for distraction than the 'walker' from both the groups in self-reporting.

If immersion is now gauged from the parameter of how the focal duration changed with time for the participants, it shows 13 participants having increasing values of focal duration (indicating increasing levels of immersion) in the AVATAR interface against 7 in the NO-AVATAR interface having similar increasing values. This is again indicative of the higher levels of immersion for the AVATAR interface. But how reliable is this linkage between focal duration and immersion? Testing for that, when the 'focal duration' data is correlated against the participant's self-reported scores of immersion there is no significant correlation between them. This throws open the alternate possibility that focal duration might have increased over time for reasons other than being immersed (could be boredom over time).

From the parameter of 'retrospective estimate of time' being an indicator of immersion, it can be concluded conditionally that the AVATAR group experienced higher immersion than the NO-AVATAR group as the former has a lower mean estimate of time. This is however based on the conventional assumption (as stated earlier) that people tend to estimate lower time if they are more immersed. The differences in the retrospective perception of time for the two groups show a

significance level that is very close to the acceptance level of .05 (p=0.069). So, though not absolutely significant, it can lend support towards a conditional acceptance of the hypothesis.

However, results that contradict this conclusion come from the subjective measure data which definitely go against the conclusion that immersion was higher for the AVATAR group than the NO-AVATAR group. The measure of immersion coming from the 12 item immersion scale shows lower mean value for the AVATAR group than for the NO-AVATAR group, though not statistically significant. The self-reported measure of immersion is also higher for the NOAVATAR group (M=6.06) than the AVATAR group (M=5.03), though the difference does not reach statistical significance.

From Hypotheses to Implications for Remediation

Results of the study and their implications for the acceptance or rejection of the hypothesis as discussed above takes us back to a more fundamental question that prodded the development of the interface with the virtual 3D avatar. In what ways does the virtual 3D digitally animated oral storyteller make a difference to the experience of immersion and distraction while listening to a fictional narrative? This question is obviously linked to the broader goal of reflecting on this process of remediating a human oral storyteller onto a digital interface and thereafter analysing the diverse factors that could have contributed to its development and usage by the trial participants through theoretical frameworks from the field of media studies and design thinking. Taking off from the immediately concluded analysis of the results and hypotheses, I will devote the remaining part of this chapter to reflect on the ways in which the results may have been influenced by the nature of the virtual entities as developed in a particular manner and the assumptions made about immersion and distraction in the process of remediation. While in this chapter I will indicate the tentative areas of reflection that immediately arise out of the results, the same will be dealt in a much broader detail through the lens of theoretical frameworks in the following chapter that would conclude the discussion.

One of the most fundamental characteristics of live oral storytelling is the intuitive understanding of the storyteller about the degree to which the audience is immersed

or engaged in a storytelling session and also the fluctuations in the immersion due to distractions of various nature. I had discussed this in my earlier chapter as to how the oral storytellers observe their audience for verbal and non-verbal cues and accordingly adapt the way they are telling the story to respond to their reactions in a more effective manner (Silva et al 2003). Some of these observations that the live storyteller makes in real time about the audience are necessary even for a virtual oral storyteller to be effective. On the other end of the spectrum, the individual members of the audience influenced by diverse factors react to the medium of oral storyteller in particular ways that reflect their levels of immersion and distraction. The results of this study albeit through the contradictions and anomalies in the results capture to a certain extent the impact of replacing the live storyteller in a real-life background with a 3D virtual avatar situated within a screen interface projecting a virtual background. It also gives us a preliminary assessment about the measures of immersion and distraction done through eye-tracking and immersion questionnaire. The analysis that follows will therefore centre around four key areas: 'rendition of the Avatar', 'the assumptions made about immersion and distraction', 'measurement apparatus' and 'experimental design in remediation experiments'. Please note that the aim of the following discussion is to point out certain pertinent questions that arise out of the results and also reveal the scope of debate around those questions that are vital to understand the process of remediation in this specific context.

A. The Rendition of the AVATAR

If the immersion has not been significantly higher for the interface with the oral storyteller and in fact may be lower than NO-AVATAR group (as indicated by the immersion questionnaire scores and self-reporting), there may be certain reasons inherent in the rendition of the 3D storyteller itself. Busselle & Bilandzic (2009) observes that when participants make realism judgements during viewing and attention shifts to 'unexplainable inconsistencies', the shifts in attention have been found to 'disrupt engagement' or immersion in a narrative. This observation was supported in this study by comments from the participants who found the 3D virtual woman delivering the story to be quite a bit wooden and 'boring' in its lip movements, facial gestures and in the lack of any hand gestures though the audio

track for the narration was reported to have a high level of drama and quality that stimulated immersion in the story. Some also found it difficult to maintain their eye contact with the 3D storyteller for a significant length of time as they found her eyes to be a bit uncomfortable to gaze at continuously and therefore had to look away towards other areas of interest in the interface.

The concept of this uncomfortable feeling and its relation to the degree of realism in the rendition of the avatar has been have been dealt with by the seminal concept of 'uncanny valley' as described by Masahiro Mori in the 1970s. Though the phenomenon was reported in the context of robotics and the way their realism or lack of it affects human affinity and evaluation, it has been found to be equally applicable for embodied conversational agents like the 3D woman storyteller that has been used in this study. The Uncanny Valley phenomenon has been reported to be a serious impediment to automated storytelling using virtual advisers and in this study, there is a strong possibility that the limited degree of quasi-human capabilities of the 3D storyteller constrained to a great degree the immersive capabilities of the interface. This will be dealt in greater detail in the next chapter along with other theoretical constructs from media studies that try to explain similar phenomena.

B. The Assumptions about Immersion and Distraction

Borrowing from earlier studies, this study has made the assumption that gazing at anything that is unrelated to the story would be treated as a distraction. However, the results of the study indicate that gazing at an entity that is unrelated to the context of the story but within the screen space filled with virtual entities may not necessarily cause distraction in the conventional sense.

It was established earlier from the results that the presence of the 3D digital animated oral storyteller with all its limitations does make a difference (even if not significant for all the entities) to the attention that is paid to a potentially unrelated visual, and that can be seen through the significant mean differences for the two groups in the case of the walker and also the total time spent on the distractions. But does that difference create a significant difference in the experience of immersion or understanding of the story in a storytelling session with embodied virtual agents and virtual 3D background? When the results from the objective and

subjective measures are seen in totality, it raises valid doubts about the conventional position about what can be defined as distractions.

I have pointed out in the earlier discussion that the gorilla is the only intended distraction out of the three designated entities (which are unrelated to the story) that has a very highly significant correlation across both the objective measurement of the total focal duration, the immersion scores from the 12 point engagement scale and the self-reported measures of immersion and distraction. This indicates that apart from the gorilla, gazing at other entities in the background (that were unrelated to the story) was not perceived as valid distractions by the participants.

Support for this phenomenon can also be seen by culling out the individual raw data for some of the participants. One of the strongest individual examples for this comes from the participant 22 (NOAVATAR group) who has the highest score (55) in the 12 point immersion or engagement scale amongst all the 30 participants (mean of 36.8) across the two groups indicating the highest level of immersion. This correlates with the self-reported score of the participant on immersion (9 in a scale of 10) and low levels of self-reported distraction for both 'gorilla' and 'walker' (4). This participant is also one of the two participants across both groups who could answer both the open-ended story comprehension questions correctly and shows a consistent significant increase in the focal duration with time (Spearman's ρ =0.225, p=.000) indicating increasing levels of immersion with time. Looking at the data for the total time spent by this participant in focusing on the 3 potentially distracting visuals, it is hypothetically expected that he should have one of the lowest values for time spent on unrelated distracting visuals. However, it can be observed that the total focal duration on all the 3 visuals together is 5.95 seconds which is the median value for the 30 participants and also higher than the mean 5.34 seconds. Leaving aside this particular participant, it should be noted that for the NO-AVATAR group as a whole the entire screen space was filled with a background that was completely unrelated to the story and all the participants spent their entire time looking at this unrelated background. When in spite of that, both the mean immersion scores from the 12 immersion scaled questions of the NO-AVATAR group (38.93) and the mean of the self-reported immersion scores (6.07) were higher than the AVATAR group (34.73 and 5.03), though not reaching significance, it indicates towards the fact that looking

at the unrelated entities in the screen may not necessarily have resulted in distraction in the way it was assumed.

This contradiction is also observed in some others in the AVATAR group, for example participant no.27 AVATAR group, where immersion score is the fourth highest (43) against a mean of 36.8 for all 30 participants, self-reported immersion score is 6 (in a scale of 10) and the correlation of focal duration with time is .441 (the highest) signifying increasing immersion over time. So, all of the parameters signify a relatively higher degree of immersion than other participants. But to be noted is the fact that this participant achieved the relatively higher level of immersion in spite of the fact that he/she spent only 30.26 seconds gazing at the storyteller (the second lowest time in the AVATAR group) where the mean time spent by all the AVATAR group participants is 122.03 seconds and the median value is as high as 140.85 seconds. Presumably the participant spent the rest of the time looking at different items in the background which were all unrelated to the story out of which he/she has spent a total of 5.54 seconds on the potentially distracting items of gorilla, fire and walker, much higher than the mean of 3.3 seconds, median of 2.1 seconds spent by the AVATAR group. The same participant however does not perceive them to be distractions (less so for 'walker') as he gives scores of 2 and 1 respectively for 'gorilla' and 'walker' in the self-reporting.

The reason for this apparent anomaly where it is observed that focusing at the defined unrelated visuals like 'walker' and 'fire' are not necessarily impacting the measures of immersion or distraction probably lies in the manner in which these visuals are being seen by the participants while listening to the story. When it comes to the unrelated images of the 'fire' or the 'walker', these moving images in the apocalyptic background were possibly seen by some of the participants with an expectation that they can potentially be a part of the overall narrative and therefore there was no clarity in their perception about their role as a clearly distracting item and their corresponding impact on immersion. Consequently, even while some of the participants were focusing on these visual components like 'fire' or the 'walker' they were not necessarily getting distracted by them to the same extent as the static moving image of 'gorilla' or mentally not perceiving them as distraction. In some cases, the participants might be getting engaged or immersed in the story even

while they were focusing on the unrelated visual images which are supposed to be distracting objects in a real-world scenario but in an interface with virtual entities they are strangely serving the purpose of creating a mental model of the story being narrated. I would like to tentatively define this category of unrelated visuals as 'beneficial distraction' which is most likely to be similar to abstract unrelated images that help us to relate to a music composition and become immersed in it. This phenomenon if true would have affected the participants in both the groups in a similar manner and therefore there is no clear correlation of the total focal duration with the subjective measures of immersion and distraction. But what can reasonably be deduced from the above facts is that the presence of the oral storyteller relatively minimized the attention of the participants towards all of these unrelated images and that translates into a difference in the time given to unrelated entities (assumed as distractions) in the background. This sort of focusing on unrelated images also possibly created more points of memories to recollect and thereby results in a higher value for 'retrospective time perception' for the NO-AVATAR interface as discussed earlier.

Another unexplainable inconsistency that possibly became a distraction for a significant number of the participants was inherent within the delivery of the narrative and was reported by some of the participants in the post-test chat with the participants. This was due to the disjunct between the narrator in the novel being a male who was talking about shaving and the oral storyteller in the interface being a female narrating it in the first person. It acted as a momentary distraction for some of the participants who were not familiar with the story as they tried to comprehend and rationalize this inconsistency. It is unlikely to have become a problem if we imagine a lady teacher in the physical world narrating the same story excerpt to her students in the first person point of view. This is another distinguishing aspect of virtual oral storytelling where the audience would probably tend to have a tinge of incredulity about every element in the interface including the oral storyteller as against a live storyteller where the audience makes a clear distinction between the story being narrated, the inert background elements and the oral storyteller as a human being who can be a different gender from the narrator in the actual story.

A similarity between this phenomenon can be seen with earlier reported concepts of 'plausibility' as an important factor in media experiences (Slater et al, 2009) where the behaviour of the viewer or the participant changes when the sensation about something being real is hampered. Distraction was therefore not limited to the images unrelated to the context of the story but also could come from the delivery of the narrative itself or even from the lack of realism in the rendition of the female avatar.

C. The Measurement Apparatus

In this study, eye-tracking tool and post-test questionnaire were used to collect data about the participants' interaction with the interface and also their state of immersion and distraction during the experience. While the immersion questionnaire with 12 scaled questions showed high degree of reliability within itself and in terms of its correlation with other variables in the questionnaire (self-reported immersion and distraction), drawing conclusions about the hypothesis became tenuous when the same were mapped to the data coming from the eye-tracking tool. These inconsistencies were discussed in the earlier sections and a lot of it can be attributed to the assumptions made about constructs like 'immersion' and 'distraction' in relation to the eye-tracking data. The fact that gazing at any image unrelated to the story may not be necessarily tantamount to distraction severely restricts the measurement of immersion through eye-tracking. There is also the fact that not all unrelated images (moving or static) may be perceived in the same manner by the users in a given context. While some may aid immersion in spite of being unrelated to the context, others may be seen as distractions.

Two other areas of inconsistency come from the single question self-reporting (immersion and distraction) and correlation of focal duration with time. Within the post-test immersion questionnaire, self-reporting of immersion and distraction may often throw up results that are inconsistent with the other data. This apparently may come from the subjective judgment of a given participant and therefore needs careful evaluation before drawing conclusions from the same. For example, participant no.11 (avatar group) throws up a score of 34 in the 12 item immersion scale (almost the same as the group mean score of 34.73 and same as median score of 34) and also shows the highest correlation of focal duration with time

(0.623) signifying higher level of immersion than the others. But the same participant gives a self-reported immersion score of 2 (in a scale of 10) which is much lower than the mean and median rating given by the AVATAR group (5.03 and 6 respectively). This raises questions about the subjectivity and reliability of self-rating.

The credibility of focal duration increasing with time being a reliable indicator of increasing immersion also needs further evaluation as reflected by the contradiction in the results for participant no.9 (AVATAR group). Participant no.9 shows a significant negative correlation of focal duration with time (-0.339) which as per my initial assumption based on earlier research should signify very low level of immersion with time. However, the same participant has self-reported an immersion of 9 (in a scale of 10) and also has a total immersion score of 48 (the highest in the AVATAR group and second highest amongst all the participants) in the 12 item immersion scale. The participant also spent the highest amount of time (167.33 seconds) in the AVATAR group gazing at the female avatar narrating the story. Going through the gaze and focal plots of the participant shows that even though the participant was looking at the storyteller, his/her focal durations were short and moving from point to point. However, the fact that this did not necessarily result in low scores in either the scaled immersion questions or in the self-reported immersion score is indicative of the fact that even with decreasing focal duration over time an individual can experience a sense of immersion.

D. Limitations of the Experimental Design

Assuming that this experiment was conducted within certain constraints of resources and research priorities, there were a couple of structural weaknesses in the experimental design that limit the strength of the conclusions. One of them is the narration of a fiction over a very small period of time (3 minutes). Immersion while listening to or reading a fiction is a complex process that often takes a relatively longer time to be experienced even if the fiction is a captivating piece of work. The factor of time taken for immersion to happen can be much more crucial where the users are conscious of an experimental situation and they are exposed to a new interface with virtual characters. The fact that the story narrated was an excerpt taken from the Dracula story without the mention of the name of the story also

makes the contextual understanding difficult and time consuming. This is in spite of the fact that the excerpt was a complete incident in itself. This will be more so for participants whose cultural background has not exposed them much to stories of this genre in English language.

This complexity of immersion experienced while consuming a fiction and the time as an important factor is evident from an earlier research conducted to observe the effects of remediation. Gorichanaz (2016) explores the relative levels of immersion through hardcover, audio books and kindle and in his discussion on immersion makes a pertinent comment that unlike popular beliefs literary immersion may not be a flow state during reading. His study suggests that 'readers can experience immersion over time, even when not reading' (p.8). What Gorichanaz's observation does show is that immersion by reading novels or fiction may take a longer time to crystallize and therefore unlike audio-visual games may not be observed within a very short span of time.

The other aspect of the experimental design that could have been improved was in the post-test data gathering process. Having structured open ended questions about the interface experience could have yielded a richer set of data. Focus groups with the participants could have also allowed me to get a deeper access into the complexity of immersion and distraction experienced by the participants as scaled immersion questionnaire or data from eye-tracking are prone to contradictions (as seen from earlier discussion) that can be complemented by qualitative data.

Summarising the Discussion

The aim of this chapter so far was to lay out the tabulated results of the experiment and discuss the conclusions that can be drawn directly in the context of the hypothesis related to the two alternative interfaces. Though the data did not produce a categorical acceptance of any of the hypotheses, the inherent contradictions and inconsistencies in the results helped in exposing the complexities of remediating a real-life oral storyteller onto a digital interface through a virtual 3D avatar. The applicability of the conventional assumptions about distraction and immersion in a storytelling interface with virtual entities were put to question after the analysis of the results. The analysis also gave an opportunity to find the gaps in

the methodology and measurement apparatus used in the study within the context of remediating a storytelling media.

However, the revelations through the analysis of the data till now have been limited to conclusions and contradictions that arise directly out of the data and the limitations of the experimental set-up. But how do these revelations or conclusions fit into the broader conceptual map of remediation as a process? Can these conclusions drawn from the data and contradictions observed thereof be explained by theoretical models in media that have looked at remediation as a constant evolutionary practise in the world of media? Also, the conclusions from the data will now be looked at through the lens of deterministic theories (to what extent technology and human cultural practices shape each other) that were discussed very early in the dissertation and hence situate this single remediation initiative in the broader continuum of media technology evolution. The analysis of the contradictions and complexity in interpreting the results that I have done in this chapter when coupled with the theoretical observations on the same to be done in the next chapter will reveal in totality the wickedness inherent in this particular situation of remediation.

CHAPTER EIGHT

The Theoretical Lens on the Numbers

The Purpose

The last chapter was focused on discussing the data that directly came out of the trial through the measures of eye-tracking and post-trial questionnaire. The preceding discussion was also solely aimed at analysing the data to see how it measured up against the hypothesis created around the constructs of immersion, distraction and retrospective estimation of time. Analysing the data revealed the difficulties in categorically accepting or rejecting the hypotheses and in the process threw up valid questions about the measurement of immersion and distraction that are the prime parameters for evaluating the usage of any media interface by the users. While the previous chapter revealed the complexity of evaluating the usage of remediated interfaces at a micro level, this chapter expands those complexities into a broader framework that involves the role of the materiality of the technology, cultural legacies around the use of media interfaces and connects the generic principles of remediation with relevant findings from the area of design.

In the chapter on 'Methodology of Design and Analysis', I mentioned the need for progressing from 'design' to 'design thinking' where the wickedness of a design situation is mostly 'indeterminate' as opposed to it being 'undetermined'. The previous chapter's aim was to treat the design problem as one that was bound by the definite limits of the hypothesis. That being done, this chapter will use the results of the study to show the ways in which the design problem in remediating an oral storyteller is essentially 'wicked' because there are no definitive conditions for its formulation or its solution (Rittel & Webber 1973). The results therefore have to be viewed through a broader theoretical framework for exposing the 'wickedness' inherent in the remediation process.

The stimulus for the discussion that will follow henceforth leading to the conclusion of this thesis will be the fact that in spite of a dominatingly significant part of the total time spent by the AVATAR group participants in gazing on the 3D oral storyteller as a whole, the results do not categorically reflect any significant difference in

immersion for the AVATAR group vis a vis the NO-AVATAR group. Certain aspects of the results did indicate that the 3D avatar had an impact on the participants' viewing of the intended distractions, focal durations over time or on the retrospective estimation of time, but in totality the results were not strong enough for a categorical conclusion. Though the research goal as such had no working goal towards creating a commercially successful 3D virtual oral storyteller, the underlying aim was nevertheless to effectively remediate the live oral storytelling performance and achieve a measureable difference in immersion in comparison to interfaces that deliver the narration without the presence of a virtual storyteller. The Unity software technology that was used to build the 3D storyteller also has the inherent aim of giving the power to the designer to build effective animated 3D characters that can bring about better levels of immersion than other similar software or their earlier versions. However, it is not a unique situation where a technology interface development fails to achieve the desired or hypothesised result. Even in its failure, rejection, trials and errors it leaves behind a trail of evidence in the form of data, decisions and anecdotes that are open to interpretation through relevant theoretical frameworks.

This is exactly what the social constructivist school of thought espouses through the 'principle of symmetry': that success or failure of models, theories and experiments should not be singularly attributed to one contributing factor like the technological superiority/inferiority or the socio-cultural or economic factors. Based on my earlier discussions on the theoretical aspects of determinism at the very starting of this dissertation, I will use the analysis of the results hereafter to crystallize the argument that the reality lies somewhere in between that of social constructivism and technological determinism. A given technology is deterministic in creating a new culture of media usage over a period of time and that cultural pattern thereafter has a deciding role in the way a new media shapes up or is acted upon by the users. However, it needs to be clarified that this dissertation is essentially not one trying to find answers to the debate on determinism. It is more about the practise of design thinking where lack of acknowledgment of the effects of pre-existing media cultures and the historicity of remediation as a process straitjackets the design thinking, thereby ignoring the wickedness of the design problem. The broader question of

what determines the shape of a new technology will only come out as a corollary to the discussion on design thinking.

The Relationship between Immediacy, Immersion and Realism

The exercise of building the storytelling interface in this research was basically an attempt in remediation that Bolter and Grusin (1999) define as the act of appropriating an older media to create a new media. Amongst a horde of diverse advantages that an act of remediation aims to usher in, the one that remains the most basic is achieving a better sense of immersion or it can even be a diametrically different paradigm of immersion. So, at the end of this prototype trial that was aimed to remediate storytelling technologies borrowed from orality and literacy to a virtual culture interface, the immediate question that becomes pertinent is '*why did the interface with the 3D oral storyteller manage to garner significant attention towards itself (as observed through eye-tracking) and yet fail to evoke significantly higher immersion than the interface devoid of the 3D oral storyteller?*' The answer to this question may be addressed through a wide range of views ranging from generalized views about the lack of suitable aesthetics in the interface to the inadequacy of the oral delivery style. However, the conceptual framework of remediation with its associated ideas of 'immediacy' and 'hypermediacy' helps us to delve deeper into and address issues related to immersion and distraction.

In the earlier chapter while discussing the building of the prototype, I discussed how in building the storytelling interface the designer (myself) and the developers incessantly strived through the use of available technologies to create 'immediacy' in the delivery of the oral storytelling performance through the 3D oral storyteller. By its very definition as proposed by Bolter & Grusin (1999: 65), a medium is 'that which appropriates the techniques, forms and social significance of other media and attempts to rival or refashion them in the name of the real'. In this case, the challenge was to appropriate the real oral storyteller and the novel of *Dracula* (from orality and literacy cultures respectively) and refashion them through the 3D virtual oral storyteller. The 'immediacy' (the act of erasing the presence of media) that was aimed at was not only in the sense of trying to simulate a live oral storyteller as much as possible and putting the viewer in the same space as the object viewed (Bolter & Grusin 1999), but also making it as 'immediate' as seeing the 3D oral

storyteller right on your desktop screen. This is no different from the idea of the transmission of President Kennedy's or Princess Diana's funeral on TV and that gave these events 'immediacy' to millions of viewers across the world who could not be physically present in the funeral. The use of the eye tracking technology to track the viewer's eye gaze patterns was primarily to draw conclusions about immersion of the participant through eye-gaze patterns and also with the secondary aim of building the database towards a future possibility of giving the virtual oral storyteller the ability to gauge the listener through his/her eye gaze patterns and give appropriate reactions as a live oral storyteller would do. This secondary aim of using the eye tracker was essentially to serve the purpose of bringing in 'immediacy' in the sense that an intelligent embodied agent who can communicate non-verbally through eyes like a live oral storyteller is another step towards erasing the limitations of the media interface and thereby enhancing 'transparent immediacy'. Though achieving realism in the media projection is not the only way of gaining immediacy (as we will see later), I will for now dwell on this idea and move on to raise two important theoretical questions. First of all, what connection does the idea of 'immediacy' have with the concept of 'immersion' as I have explored through this experiment? Secondly, how was 'immediacy' enhanced or compromised in this interface building exercise and the participant trial.

Answering the first question, about the connection of 'immediacy' to the objective of attaining 'immersion'. The concept of immersion has been generically used for 'novels, movies, drama, representational paintings and those computer games that cast the user in the role of a character in a story' but has not been applied in that sense to philosophical works, music and abstract games like bridge, chess and tetris (Ryan 2001: 14-15). Though latter ones like philosophical works or a game of bridge or chess can surely get human beings completely engaged, the engagement has been seen as different from the 'immersion' that one feels by transporting herself/himself into a fictional world rife with dramatic action. In the context of reading a novel, immersion is the experience through which 'a fictional world acquires the presence of an autonomous, language-independent reality populated with live human beings' (Ryan 2001: 89). Though 'immediacy' or transparency of the media is not necessarily the only contributing factor for achieving immersion in a

storytelling scenario, transparency of the media has always been a goal for all media interface designers including virtual reality. The linkage between 'immediacy' (as posited by Bolter & Grusin) and immersion is similar for all storytelling media including oral storytellers, movies in theatres or in virtual reality media interfaces. While theatres try to enhance immediacy and immersion by adopting measures like darkening the theatre room, placing hidden 3D surround sound in strategic locations that create authentic experience as much as possible, oral storytellers or printed novels try to achieve immediacy through 'high realism' that 'effaced the narrator and the narrative act, penetrated the mind of the characters, transported the reader into a virtual body located on the scene of the action' (Ryan 2001: 4).

If a media interface or a remediation effort fails to achieve its desired impact in terms of immersion, (for example, the relative ineffectiveness of the 3D storyteller in this study), one of the parameters that should therefore be questioned is its effectiveness in achieving immediacy or transparency. This is very much comparable to my earlier discussions where e-books were shown to be stagnating in consumption because a significant section of the readers saw the technology components of the interface (light, buttons, weight etc.) as an impediment to getting lost in the story which in other words has been referred to as the 'phenomenologcial immersion'. Very similarly, if a live oral storyteller wears a costume or uses a perfume that is in conflict with the context of the story it may reduce the immediacy or transparency of the media (the oral storyteller in this case) and also result in a reduced degree of immersion as a consequence of that. If the linkage of 'immediacy' with 'immersion' has been established to be significant from historical precedents and theoretical arguments, then the next step is to address the question of whether the reasons for the 3D oral storyteller not making any significant difference in immersion can be traced to the degree of immediacy achieved in this interface or the manner in which it was compromised.

The fact that even without the software developers being aware of the theoretical media concept of 'immediacy' and its practical implications, achieving 'immediacy' was a dominant goal of the developers evident from some of the post-development interview excerpts. One of the software coders says 'We have put some lighting in there. So this lighting is like a bit of flame flickering on it 'cause there's like a flame-y

thing in the background. So these are things that we added after our original plan', 'so our original user interface was good but not fantastic and now –the way it looks now, it really looks lifelike and in place'(interview with author 2014). The second developer in the same interview mentions the fact that having an interface without any buttons to press and the user looking naturally with eyes also added to the realism. Earlier in the chapter on prototype development I mentioned the effort that had been made to get lip-synch of the 3D storyteller as close to perfection as possible and also work was done on making head rotation mimic natural human head rotation while speaking. These display amply that achieving realism in the interface experience was the core goal of the team in the development phase. However, there were certain glaring inadequacies in achieving verisimilitude with a real-life storyteller that were self-evident but were accepted more out of constraints of time and resources than unconscious errors. One of these inadequacies was in the lack of visual features that oral storytellers use in form of gestures and expressions. Oral storytelling performances use a combination of verbal, vocal, visual and sometime even haptic features and 'cognitively it seems that synchronized features from verbal, vocal and visual aspects help to maintain a keen engagement between emerging story elements and the audience's mental processes' (Lwin 2010: 372). Any effort to remediate oral storytelling in virtual culture will need to be aware that the visual features of an oral storyteller are as important in enhancing immersion as the content of the story being narrated. Lack of the visual features of the 3D virtual storyteller in this study would have made the participants aware of the limitations of the media created animation, because there was a disjunct between the historically developed legacy of oral culture (of which we are all a part), thereby limiting the immediacy of the interface.

The 3D avatar of the oral storyteller therefore would have been judged against the criterion of cultural norms that have developed through the culture of orality and which exists as cultural residues within the users. Apart from the cultural legacy which influences the expectations of users from any new media interface (as happened with e-books against printed books), the users' prior media experience with the realistic rendition of avatars in other media products (like games) adds to the expectations and thereby enhances the disjunct. This disjunct was also

apparent from some of the feedback received from the participants which I pointed out in the earlier chapter where they felt uncomfortable having a consistent eye-contact with the 3D virtual woman whose expression looked wooden and cold.

As an interface designer, I was aware of the time constraint of the software developers and their limitations in using Unity software forcing us to reduce the scope of the remediation exercise. That being a reality behind every exercise in remediation where there is a difference between the ideal and the achievable goals due to constraints ranging from that of financial resources to the affordance of available technology, the ultimate shape that the interface takes therefore becomes a function of those constraints. This is the very same argument that social constructivists posit in the context of debates on determinism, where they see a given technology as a culmination of socio-cultural or economic constraints at a given point of time and the success or failure of the technology is not merely rooted in the technology itself. The aspect of pre-existing culture and expectations built around them impacting the development and usage of the interface will arise in different contexts as I progress through this discussion. The purport of my discussion so far was to point out the relevance of 'immediacy' in this experiment in remediation and how immediacy of an interface is not driven by the mere power of the technology but also by the decisions of the designers and developers, their real-life constraints along with their limited powers of handling a given technology. Now, given the fact that achieving 'immediacy' through realistic rendition of the original is relevant for achieving a desired level of immersion in any act of remediation, the next level of discussion will be guided by the rhetorical question: To what extent could this interface with the 3D avatar be more immersive, if in the next iteration, the resource constraints were to be significantly reduced in order to achieve a much higher degree of realism in the rendition of the avatar?

Is Immediacy only about Realism?

Answering the rhetorical question as stated above is important as interface designers more often than not are tempted to reduce their design problem for the next iteration to the simplistic solution of achieving a higher degree of realism in their rendition through better technologies and skill. Though achieving realism through media is tantamount to an exciting journey towards a utopian stage where a

human user will finally feel no difference between the real and the virtual, what are the collateral fallouts in terms of achieving a more immersive interface?

Based on the findings of certain earlier research, I would posit that achieving a higher degree of 'immediacy' and 'immersion' does not have a simplistic linear relationship with the degree of realism in the rendition of the avatar. While we can hypothesize that having a more realistic 3D animation of the oral storyteller (in the next iteration) with ample multimodal visual features would add to the immediacy and therefore to the immersion, this is only a straitjacketed outlook which is amply displayed by the graph of the uncanny valley as used by Mori (1970).
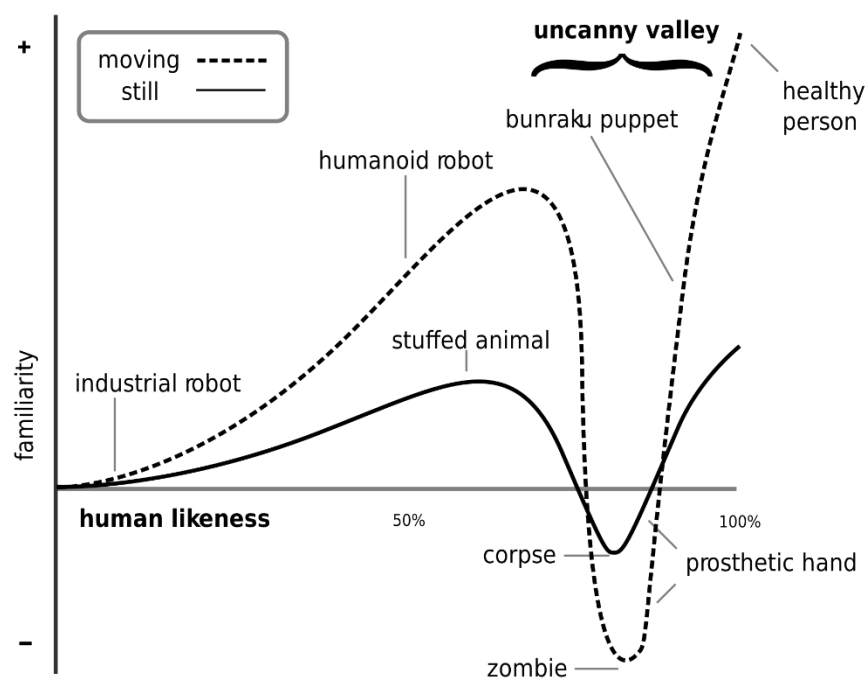
Figure 26: The proposed relation between the human likeness of an entity, and the perceiver's affinity for it.

Mori's conclusions on how human affinity towards a robot or human like entities changes as we make them look more and more like real human beings have wide ranging implications for designers when seen in the conjunction with the theoretical construct of immediacy as discussed earlier. Mori's (1970) seminal observations conclude that as industrial robots with little or no human similarities progress towards humanoid robots that have basic structural features similar to human beings but yet very different from real humans, people start reacting more positively

towards the robot. However, with further increase of similarity between human beings and robots, the human affinity towards the artificial human starts showing decreasing marginal utility and may even become negative to see the character as equivalent to a corpse or a zombie. Research conducted based on Mori's original idea in the context of robotics design have confirmed its fundamental relevance to virtual characters, embodied agents and avatars in video games or movies (Tinwell et al 2011; Thompson 2005) but the phenomenon may not be as simplistic as suggested by Mori. Confirming the fact that 'human like characters risk falling into the uncanny valley'(Tinwell et al 2014: 328), study results indicate that even the best of animated characters created with utmost realism are rated as more uncanny than humans and that, 'in virtual characters, a lack of facial expression in the upper parts of the face during speech exaggerates the uncanny by inhibiting effective communication of the perceived emotion, significantly so for fear, sadness, disgust, and surprise but not for anger and happiness' (Tinwell et al 2011: 748).

This serves as a significant explanatory tool to explain the results of my study where the 3D character in spite of our best efforts failed to create any significant difference in immersion (in fact the total immersion score was higher for the NO-AVATAR interface). The 3D woman storyteller that was built from the templates provided by the Unity software had structural features completely similar to a real human but lacking in gestures that are characteristic of an oral storyteller due to time and resource constraints. Yet while carrying out this analysis in retrospect, it becomes essential to realize as designers that adding gestures to the 3D storyteller and bringing it closer to the real human would not necessarily be enough to make a significant difference in immersion against a similar interface that does not have the 3D storyteller. Mori's (1970) word of caution was originally for the designers of robotics but over time has been found to be extremely relevant for designers of any of the virtual human agents that we create.

> "because of the risk inherent in trying to increase their degree of human likeness to scale the second peak, I recommend that designers instead take the first peak as their goal, which results in a moderate degree of human likeness and a considerable sense of affinity. In fact, I predict that it is possible to create a safe level of affinity by deliberately pursuing a nonhuman design' (p.100)

The reference to the 'second peak' is in the context of the graph provided earlier in Figure 25 which shows the second peak to be the one with maximum affinity when the human likeness is almost same as real human beings. Though attaining the second peak of realism is conventionally assumed to be the ultimate goal of remediation involving embodied virtual agents, Mori's theory buttresses the argument: lack of 'Immediacy' or 'transparency' of the media (in this case the 3D oral storyteller) might have been a strong factor in determining the immersion during storytelling, but it is not the sole driving factor that affects the immersion positively. A virtual embodied agent loosely resembling human structure could also become a good storytelling medium in a given situation. Mori (1970) illustrates this possibility through the example of Japanese puppet shows where a 'bunraku puppet appears similar to a human being' but 'Its realism in terms of size, skin texture, and so on, does not even reach that of a realistic prosthetic hand' (p.99). Yet we 'get absorbed in this form of art' of storytelling and feel the strong 'affinity for the puppet' characters ignoring the 'the puppet's absolute size' (Mori 1970: 99), as long as its 'total appearance, including hand and eye movements is close to that of a human being'. I would therefore argue that 'immediacy' or using realism to invoke immediacy in a storytelling medium may not be a linearly laid out path when we try to link it to immersion in storytelling scenarios. This is however not in defence of the inadequacies in our own 3D animated characters but only goes to set forth a perspective in this remediation design process that is often ignored in the quest of immediacy.

A concept that is dialectical to that of immediacy is 'hypermediacy', also coined by Bolter & Grusin (1999). 'Hypermediacy' refers to the user being made aware of the fact that the experience is mediated. Though immediacy and hypermediacy may sound antithetical, they work alongside each other at the same time. Even as we use the immediacy of a skype video conversation, we are always aware of the fact that the internet makes it possible and the various controls in the skype interface keeps us aware that it is mediated and not real. Digital Storytelling (DST), a powerful method in modern storytelling uses a combination of texts, photographic images, audio, moving visuals and animations to give a sense of immediacy to a story, and at the same time through the act of using multiple media forms makes us

aware of the act of mediation. However, the argument that I will try to use in this context hereon is the fact that this double logic of immediacy and hypermediacy may not always necessarily work to the satisfaction of the user or serve the purpose of immersion. There are points when in search of immediacy 'hypermediacy' may breach the critical balance and compromise the immediacy as an overall impact. Though Mori's theory of the uncanny valley does not deal in immediacy and hypermediacy, his graph of decreasing affinity for the embodied agent with increasing human likeness (beyond an inflexion point) can also be seen as a function of this critical balance between immediacy and hypermediacy. With increasing immediacy, it is expected that the awareness of the media (hypermediacy) would decrease. However, Mori's conceptual framework supported by further research on the same lines strongly indicate that this assumption may not work in a remediation design situation involving virtual characters.

Hypermediacy: The double edged sword

This awareness of the media which is termed as 'hypermediacy' is a double-edged sword in the overall process of media consumption. Even while hypermediacy always acts in conjunction with 'immediacy' to maintain the sense of marvel about the media and/or even as we become immersed in the content, it helps us maintain the distinction between the 'real' and the 'mediated'. However, the overbearing presence of the media or the process of mediation may become a distraction by itself and reduce the immediacy in the interface. We have had ample indications of such occurrences related to e-books through the focus group survey data and also through past research on e-books where e-books have been critiqued or disliked because of the overbearing presence of the technology in the interface. Could hypermediacy have possibly played a similar role in the results of the prototype trial in this research? My discussion will centre on possible areas of hypermediacy as indicated by the results of the study and also how hypermediacy could have possibly affected the sense of immersion or distraction.

Hypermediacy has normally been treated as one singular concept in dealing with the subject of remediation. However, in pointing out the instances of possible 'hypermediacy' in my interface trial, I would also like to extend the argumentation in categorizing hypermediacy into different forms and characteristics. This is based

primarily on the fact that in new media, the same data or content can be presented in different formats through different interfaces. For example, a graph can be seen as 2D or 3D or an interactive 3D version through different interfaces and each interface has its own peculiarities of impacting the user. So, a new wave of thinking is emerging in media research which suggests that the 'old dichotomies content-form and content-medium can be rewritten as content-interface' (Manovich 2001). As a logical corollary to that, hypermediacy, the phenomenon of staying conscious of the act of mediation, also therefore needs to be seen as a function of the 'interface' and 'content'.

Hypermediacy of the Interface

In the development phase of the interface or the content, hypermediacy as a concept was not deliberated upon and the design decisions were based mostly on the available resources and constraints aimed at maximizing the immersion in the story narrated by the 3D oral storyteller. However, in post-trial analysis using the conceptual lens of 'hypermediacy' helps us to look back at what the interface experience would have meant for the users and some possible explanations for the results.

Without being conscious of hypermediacy as a theoretical concept to be applied, the active effort on my part as designer of the interface experience was to reduce the user's requirement for handling of any of the media technology. The study design was therefore done in a manner that the participants did not have to actively press any button or any key in the keyboard in order to activate the storytelling process, thereby reducing the hypermediacy of the interface to a certain extent. The speakers were also kept hidden in order to make the narration sound more authentic and seem unmediated. Activating the storytelling on both interfaces was carried out by the study coordinator from a different PC desktop. The only technology that the participants had to interact with was when the eye calibration process was carried out for the eye tracker to track their gaze. However, even with minimum scope of the participants having to handle the technology actively, in retrospect it becomes apparent that the awareness of the media (hypermediacy) is a running undercurrent in the consciousness of the user even when s/he is not actively interacting with the technology interface. One such reason pertains to the

size and shape of the interface itself which in this case is the presentation of the content within a rectangular shaped computer screen of 42 / 30 cms display window with a screen resolution of 1920*1080.

Remediation effectiveness has always been found to be affected by the size and shape of the interface or the screen, irrespective of the quality of the visual within the frame. To provide a simple example, landscape or portrait painters have often preferred large canvases against smaller ones or mural painters paint on walls in order to immerse the viewer through the sheer domination of the content and reduction of the awareness of the canvas frame. The linkage between the form of the interface and immersion in storytelling media interfaces has been explored to a certain extent by the research on how the size of the television screen influences 'presence'. Presence has been defined by some as a sense of being there or the feeling of being inside a mediated environment. (Sheridan 1992, Slater & Wilbur 1997). A more overarching definition of presence has been from Lombard & Dilton (1997) who saw it as a 'perceptual illusion of non-mediation'. The illusion of non-mediation has been found to happen when 'a person overlooks or fails to perceive the existence of a medium or technology in his or her communication environment and responds as if the medium were not there'(Bracken 2005: 193). Connecting this idea of 'presence' to the discussions on 'immediacy' and 'hypermediacy' as discussed earlier, it can be said that a higher value of presence would mean a higher sense of 'immediacy' and a lower level of 'hypermediacy'.

Though my study did not measure presence as a dependent variable, it needs to be clarified that 'presence' has been found to be 'a variable with various levels and dimensions', immersion being one of the dimensions (Biocca & Delaney 1995: 62). Thus immersion being an integral dimension of presence, it can be premised that immersion in a storytelling scenario will also be indirectly influenced by the size and shape of the interface. The linkage between presence (also immersion) with the size of the media interface has been found in earlier research to be very strong as participants who watched the large screen television reported feeling a greater "sense of physical movement," enjoyment, and involvement than viewers who watched the scenes on a small screen television (Lombard et al 2000: 92). This was carried forward further by Bracken's (2009) findings on the linkage between

presence, immersion and image quality. Higher levels of presence and immersion were reported by viewers who watched a neutral content on HD television than those who watched the same content on NTSC Television. The HD television viewers reported that they were able to 'observe the people's facial expressions and body movement' and also 'nonverbal communication' better than those who saw the scenes on NTSC television with reduced quality (Bracken 2009: 302).

In light of the above findings and linkages, when we retrospectively analyse the results of the interface trial in this research, one of the possible reasons behind the 3D avatar failing to make a significant impact on immersion may lie with the fact that the 3D storytelling avatar was situated within the relatively small desktop computer screen within a much larger room creating a strong sense of 'hypermediacy' (awareness of the mediated environment). The results could have been different if the same content was screened through a much larger screen that shuts out the user's awareness of the limiting boundaries of the smaller size computer screen and makes the 3D Avatar more transparently immediate. While the desire or objective for remediating the oral storyteller was justified by the overwhelming majority of the initial questionnaire survey respondents favouring a live oral storyteller against an audio book narration, achieving higher immersion through a remediated 3D oral storyteller could be a function of how much the participants perceived the projection 'environment as one that could approximate a non-mediated interaction' (Bracken 2009). It should however be noted that the argument is not to posit bigger screen size as a generic necessity for achieving a desired level of immersion, but a bigger screen size may be vital to certain kinds of remediation in the same way as painters choose canvas of different sizes for achieving their desired sense of immersion amongst the viewers.

The human desire for transparent immediacy through remediation has always been a challenge in terms of the interface irrespective of the content. Bolter & Grusin (1999) provide appropriate examples of how 'hypermediacy' of certain interfaces that attempted to bring 'immediacy' through moving images resulted in the ultimate extinction of those media interfaces. The phenakistoscope used a spinning wheel and multiple images to give the feeling of moving image which would essentially be more realistic and therefore more immediate than a static image. However, its

appeal of immediacy was offset by the hypermediacy in 'the contraption of the phenakistoscope itself, when even its name was so contrived' (Bolter & Grusin 1999: 37). A similar phenomenon was observed in case of stereoscope where users were offered three dimensional images that seemed to float in the air. The eeriness of image and the unwieldiness of the instrument made users aware of the media interface in a manner that 'seemed to be a more or less ironic comment on the desire for immediacy' (Bolter & Grusin 1999:37). Both these media interfaces faced extinction, even while the conventional camera flourished, proving the fact that even while we constantly desire immediacy through realism in media, an overbearing incompatible presence of the media interface can distract the users from the content. It should also be noted that over the course of time that same desire for immediacy through the realism of moving images was ultimately satisfied by a much more evolved media technology of movie projection in large screen theatres. Though the current study stopped short of measuring the role of the interface vis a vis the content in attributing the cause for the insignificant effect of the 3D oral storyteller, I would argue based on this discussion that a 3D oral storyteller within a relatively smaller size computer screen would be plagued by hypermediacy caused by the limited screen size of the interface and therefore the desire to achieve immediacy of a live oral storyteller may become as ironic as that of phenakistoscope or the stereoscope. We have earlier seen traces of such ironic incompatibilities of interface when users liken e-books to food pills instead being of the actual food. This section of the discussion hinges on the possible impact of the interface screen size on immersion and that can essentially be seen as a case supportive of technological determinism where the physical attributes of the medium plays a deterministic role. I will progress from that onto a perspective that looks at interfaces from a cultural perspective where people develop cultural conventions around media interfaces and the expectations arising out of those conventions have an impact on how users engage with a new media interface.

The Media of cultural interfaces

With 'distribution of all forms of culture' becoming 'computer-based, we are increasingly interfacing to predominantly cultural data : texts, photographs, films, music, virtual environments' and in a sense we are no longer interfacing to a

computer but to a 'culture encoded in a digital form'(Manovich 1997:110). Manovich therefore looks at the human-computer-culture media interfaces as 'cultural interfaces' because they represent different cultures through essentially the same media. The difference between computers and other forms of earlier media is that computers can store and present any form of earlier media which are all stored as bytes of data. However, each of these different cultural forms have a set of conventions that have developed over a long period of time. Each of these, printed word, television, cinema or orality have a set of cultural conventions of how information is presented. But when these cultural forms are remediated through a computer, the interface in terms of the hardware imposes its own logic and conventions on the cultural form that is to be remediated. For example, before the advent of the e-book reader, when books were presented as PDF texts or HTML format in desktop computers, they conflicted with the cultural convention of reading the printed book where the interface was hand-held and pages had to be turned to move across the interface. This eventually resulted in the physical computer interface needing a change in the hardware that represented more closely the shape of a book and e-book readers were introduced as the physical interface resembling book size and shape and with functionalities that resembled the printed book. Although even after the change in the physical interface e-books have not had a smooth ride as discussed earlier, the fact is pertinent that desktops as the physical computer interface could not have achieved as much as e-book readers could. Manovich (1997:112) while discussing cinema and print therefore makes a resonating point that 'each has its own grammar of actions, each comes with its own metaphors, and each offers a particular physical interface'. Both cinema and the desktop computer have a physical interface that is a metaphor of a 'window opening up into a virtual 3D space'. While the visual action of the story being seen through the window of a cinema or a desktop or a Television screen may be a good enough metaphor for the immersion of the user, the same metaphor may not apply in the context of the oral storyteller where the concept of seeing the story voyeuristically through a window is not the metaphor for oral culture. The unique feature of the oral storytelling session being the direct face to face presence of the storyteller and the story consumer, placing the virtual 3D oral storyteller within any bounding window

like interface creates a double sense of hypermediacy (that of the storyteller and that of the computer screen). Very much like earlier media forms like print books and cinema developing a set of conventions over a period of time, viewing on a computer screen with digital media has developed a set of expectations that is carried forward irrespective of the content and the remediation that is done through the computer screen. Everything that is within the screen is seen as a scripted digital projection and every item in that projected content is expected to be virtual, unlike the oral culture where the storyteller along with their background is real . In the computer screen like that of the television or the cinema screen, every object and character is seen as part of a scripted story and the user therefore looks at every item as a part of the story enactment, unlike the oral culture where the story lies in what is being narrated through the live real storyteller and the background apart from the storyteller is normally a neutral ambient surrounding which has no direct relation with the story.

The uniqueness in the conventions arising out of the difference in the physical interface will possibly result in a narrative confusion that reflects in the immersion of the user in the story. Where is the story? Is it in the story that is being verbally narrated by the virtual 3D storyteller or is it in the whole screen that is in front of the participant? Is the storyteller a character in the story or is she a mere narrator? This is reflected partly by the informal post-experiment comments from a couple of AVATAR group participants who expected the 3D oral storyteller to play an active role in the story scenario. One of the software coders reveals in the interview that during the Technology Demonstration Fair where the interface was first shown 'a lot of people said 'cause she's a female avatar and it's an adult – that's kind of adult content story, so it's a vampire story, not really for kids'. These expectations presumably come out of past cultural experiences with the media and therefore colour the user's perception and act of engagement. The cultural expectation inherent in the users exposed to the digital virtual world is also reflected by comments from participants expecting the walking man in the background at a distance to be a part of the story and probably even transform into something else. The world of primary orality however does not allow for such magical transformation in the background and the only drama is in whatever is communicated is through the

oral storyteller. This is where the virtual world within the boundaries of a digital screen interface differs from that of primary orality. While the former (in this particular interface) is like seeing through a window created by the computer screen, the other is the oral storyteller as the sole media entity. This difference has an impact on the immersion itself as participant's gaze historically shaped by the conventions of seeing through a window (television, movies, desktop, mobile or i-pad) scatters the gaze at all different places in the screen exploring every entity that has a potential linkage to the story or a message to communicate.

This is reflected in the gaze pattern of the participants and their responses regarding the planned 'distractions' that had been put in the 3D animation. A majority of the participants spent a significant time scanning the screen and focused on multiple items while the story was being narrated even while the significantly higher proportion of the total time was spent in looking at the 3D oral storyteller. As stated in the earlier chapter, the walking man which was intended by me (the designer) as a distraction instead created expectations as a potential character in the story being narrated. In the same screen space however, the static photograph of the gorilla moving across the screen was seen by both groups as a significant distraction and some of the participants even commented that they realized within a few seconds that it was a just a still picture cut and pasted without having any bearing on what the story was telling them.

Bolter & Grusin (1999) would define this as a case of hypermediacy, where we observe the mixing of multiple media forms (still pictures, paintings, black and white images mixed with colour images, texts, annotations etc.) that has become a common practice over time in news, music videos, digital storytelling or even in conventional movies. Some of the best examples of the positive effect of such conscious use of hypermediacy in the content is when Hollywood films have had a long history of mixing animated characters and sequences with live actors, some of the most recent examples being 'Avengers: Infinity War'(2017) or The Diary of a Wimpy Kid (2017). Documentaries in colour use old black and white photographs as cut-outs along with their live moving sequences in order to tell an authentic story. However, such acts of hypermediacy do not clash with the aim of achieving transparent immediacy or immersion and are not perceived as distractions as long

as they have the potential to be relevant to the story being told and thereby achieve a sense of authenticity. Thus, there is a historicity to these patterns of remediation happening within the content and I will argue that they have become part of our media culture. It is the same cultural conventions that possibly create a difference in the manner the 'gorilla' and the 'walker' are interpreted by the participants.

In the interface in this study, the only difference between the gorilla and the walking man was in the nature of their remediation. One emerged from a still photograph where our cultural experience reminds us of its limited capacities for action or communication. The walking man on the hand was an integral part of the animated 3D scenario (either with the 3D storyteller or without it) and our cultural experience with digital technology products (games, movies etc.) has made us aware of the potential that such virtual animated digital characters can play a role which is integrated into a story.

Now a rhetorical question: would it have made a difference if the gorilla was also a 3D animated moving body in the background? Possibly, yes. Very much like the 'walking man' which was also completely unrelated to the story and yet not seen as a distraction to that extent because participants saw potential in it being linked to the story, the walking gorilla would also have possibly held the gaze of the participants from both the groups and yet not been perceived by the participants as a distraction to the story.

This leaves some interesting pointers for interface designers who want to remediate oral storytellers into digital virtual interfaces. Unlike a real oral storyteller with a real background, in screen based interfaces everything within the screen is expected to be gazed at by the viewer in terms of its potentialities. This is so because the audience from their past experience with screen based interfaces are aware that every pixel of the screen represents the choice made by a designer/ director and they have digital abilities of mutation. Therefore, the audience is likely to engage his/her eye gaze looking at multiple items, aware of the media designer having designed the space and therefore each item is rife with possibilities. But in the real-life oral storytelling, the only drama is in the words and the multi-modal communication of the storyteller and the audience is more likely to focus on the storyteller for the drama, than on any real background item with an expectation for it

to be a part of the story. A fire torch burning in the real background of a real-life storyteller will in all possibilities be seen as just a source of light, but when designed within a virtual interface it becomes imbued with potentialities of morphing into anything else or playing some direct or indirect role in the story that has a horror plot.

This idea of visual entities being perceived in terms of their 'potentialities' is an essential characteristic of the emerging virtual culture that needs to be accounted for when we use the data from the eye-tracking technology. While the eye-tracking technology can give accurate data of every participant's gaze on entities within the screen space, the interpretation of the gaze may need different criteria before classifying the gaze as a signifier of distraction and immersion. The tricky part of remediating a real-life oral storyteller into a virtual 3D avatar in a background with virtual entities lies in the fact that with shifts in media culture, the gaze of media users can be expected to undergo shifts that are both quantitatively and qualitatively different. Recollecting the contradictions and complexities that dominated the last chapter while interpreting the eye-tracking data and reconciling that with scores obtained from scaled questions or self-reporting, it becomes apparent that the designer's assumptions about the gaze, focal durations over time, distraction or immersion modelled on earlier media cultures of orality and literacy may not necessarily hold true for storytelling scenarios in the virtual culture. While so far culture built around media interfaces was shown to be a factor in influencing immediacy, hypermediacy and immersion, I will now progress to elucidate on how the user's personal frameworks of interpretation can make a difference to the manner in which they interpret data as 'objective' or 'subjective'.

Limitations of 'objective' and 'subjective' data

In research conducted in the area of human-computer-interaction, it has been a general convention to refer to eye-tracking data as objective against the data from questionnaires or self-reporting as 'subjective'. However, this distinction between objectivity and subjectivity is blurred when the eye-tracking data is interpreted through certain assumptions about gaze behaviour that may still be mired in subjectivity and therefore may lead to unwarranted conclusions for the interface designer. In my analysis of the results of the trial, I had given specific examples of

cases where participants with high scores in the scaled immersion questionnaire, story comprehension questions and self-reporting had gazed at supposedly distracting unrelated visuals and yet never felt distracted. There were also cases where in spite of decreasing focal duration with time (which signifies lower immersion), participants have scored the highest in the scaled immersion score and also self-reported scores. Even while listening to the story with a high degree of engagement, participants may be gazing at different elements of the virtual scene in the screen with intrinsic expectations of connections to the story based on their own discovery of potentiality (even though there is none) and therefore might not have felt distracted at the cost of immersion. Yet the eye tracker might see the same as distraction by the designer's assumption that gazing at anything unrelated to the story is an act of being distracted. On the contrary, it may well be the case that the audience is truly getting distracted from the real story by gazing at different items that are unrelated to story and yet holding the naïve belief that they were not a distraction (as seen in this study). What we choose to look at within the screen interface and how we interpret the object of our gaze in the context of storytelling is also a function of the user's framework of interpretations. This framework of interpretations might be entirely personal to the user or may also be because of the user belonging to a category of society who live within certain shared values, beliefs and experiences.
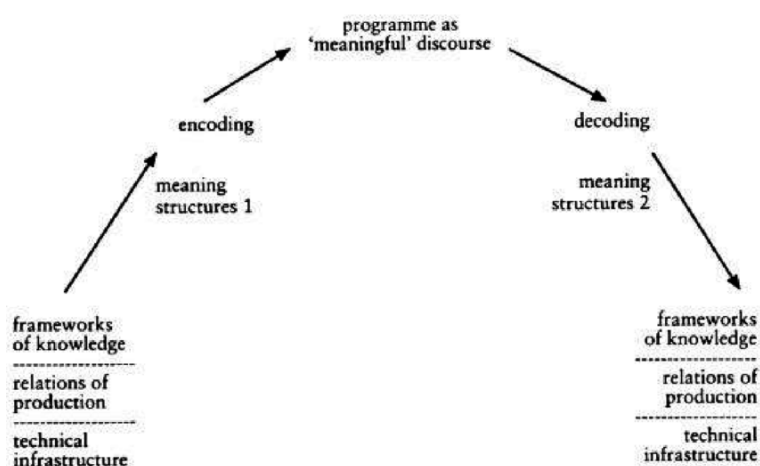
Figure 27: Encoding and Decoding of Broadcast Structures

Source: Hall (1980)

In trying to understand this variability within the users, the seminal theoretical framework of Stuart Hall (1980) has a certain degree of relevance, though it was originally conceived for broadcast media content and not for remediation in virtual culture. Nonetheless it becomes relevant as the model posits the idea that meanings that are encoded by the producer of the content during the creation of content do not remain exactly the same when decoded at the other end by the users of the content. This difference in the 'meaning structures' 1 & 2 (for the producer and the user respectively) happens because the foundations on which these meaning structures are created are not exactly the same for the producer and the user. While producers encode a meaning depending on their own framework of knowledge, relations of production and technical infrastructure available to them, every user decodes it in different ways depending on his/her background of knowledge, economic class and technical infrastructure available. To provide a simple example, a television programme shot by a producer/ director inspired by a particular style of cinematography on high definition camera with a certain schema of shot-taking and storytelling, may elicit a negative response from an audience member whose television set is not high definition (HD) or someone whose television is HD but the visual preferences are in contradiction with that of the producer. Thus the technical infrastructure or the visual preferences of the audience within which the content is consumed makes a difference to the original meaning or effect that is intended.

Moving away from media theory, the implication of this variability within the users have been reported in the area of Human-Computer Interaction in relation to the measurement of presence in virtual reality technologies. Lombard & Ditton (2006) report that 'presence' as a perceptual illusion is essentially not a generic phenomenon but is the property of a person. Resulting from an interaction of the user with the material and content characteristics of a medium, presence can vary widely across individuals and also across time for the same individual. Such variations can also happen with regards to the degree of uncanniness that a user experiences when viewing virtual characters and its cascading effects on immediacy and immersion experienced by the user. Brentan *et al* (2005) suggest that those involved in 3D software modelling or with advanced experience in playing video

games may be more accustomed to virtual characters and hence less likely to detect uncanniness in human-like virtual characters. Tinwall *et al* (2009) experimenting on the same concept suggest that the degree of uncanniness felt is not about prior familiarity with virtual characters but is more a function of one's exposure to technology that raises the bar of discernment between the real and the unreal. An individual exposed to playing games with virtual characters or technologies that use wearables or eye-tracking may display a different gaze pattern than those who have been relatively less exposed. On a different note, the use of a female avatar with cleavage-revealing dress may not attract gaze (at the cost of immersion) from an individual living within a western culture (where the dress is more common) in comparison to an individual from a more conservative oriental culture. Building on these findings, I will argue that a neat categorization of the data collection tools as 'objective' or 'subjective' may be premature as both may be mired in subjectivity in absence of valid criteria for evaluating interactions with virtual characters and scenarios.

The constructs of immediacy and hypermediacy that are an intrinsic part of any remediation effort, also vary amongst users following the same logic. Rock concerts may be immediate and authentic for a large section of the population for very valid reasons, and yet may be perceived as hypermediated and unreal by others for perfectly different reasons (Bolter & Grusin 1999). A similar phenomenon is seen with animated cartoons that children and many adults also find to be immediate, but for most adults they seem to be hypermediated. These variations in the way 'immediacy' and 'hypermediacy' can vary for different sets of users are mostly not accounted for by the technology or tools that measure the user reactions.

One of the most potent factors that plays a role in such differences within the users which in turn increases the complexity of the data analysis, is the variable capability of human users to imagine the 'potential' in a given entity which may be virtual or tangible. The discovery of such 'potential' which is virtual, may vary with individuals, social and cultural groupings or even demographics. That realization in itself opens up a different paradigm for looking at media interface design in the virtual culture. The aspect of 'potentiality' as a defining characteristic of virtual culture and its impact on interface design will be discussed in greater detail in the next section.

Virtual Culture: Immediacy through potentiality

We have seen through the earlier discussion on the 'uncanny valley' phenomenon that the idea of achieving physical 'realism' and 'transparency of the media' may not be the only axe to grind for the interface designers.' This is more valid for storytelling media interfaces where the symbolic entity that holds no physical resemblance to the actual can play the character based on their potentialities to be seen as those characters. A similar possibility comes out from the findings of the focus group data conducted in the exploration phase of the study.

The focus groups carried out on a different set of participants before the interface design (stage of exploration) strongly indicated a similar affinity of participants towards potentialities of tangible interfaces as oral storytellers. The preference for a rug or a dog which are not essentially storytellers in the normal scenario but were seen as the potential storytellers had a higher sense of immediacy for the respective participants than any screen based computer interface. It's not rare to see such things happening in sci-fi, fantasy fiction movies or games where tangible animals or non-living objects are imbued with human qualities of emotions and communication. The desire of the participants is however not to see these on the screen interface but in fact to see real physical objects in their surrounding environment like rugs and dogs (or even bottles, mirrors) being imbued with these abilities. Though the participants were just imagining out of the box possibilities of how they would like stories to be narrated, the possibilities point towards the new direction that storytelling in virtual culture could assume.

I would posit that the virtual culture will not merely be limited to virtual images but will encompass tangible objects that are seen to have the potentiality to convey a story. This is derived from the fundamental definition of virtuality as discussed in an earlier chapter on the features of oral, literacy and virtual cultures. Drawing from my earlier chapter where I laid out the assumptions behind the term 'virtual', a rug may not have the physical structure of X (human live oral storyteller) but may have the information structure of X (the oral storyteller). From the design perspective, it becomes therefore essential 'to distance oneself from the concrete reality (which may not be important)' and consider the 'seeming of a thing' (Rheingold 1991: 177). The design choices in the process of remediating an oral storyteller do not therefore

stay limited to creating a truthful replica image of a human oral storyteller which may create its own share of confusing assumptions and benchmarks for interpretations. As we saw in this study, the problem becomes critical when a virtual character's potential remains a matter of suspense because of its presence within a screen space. Quite a few participants pointed to the confusion that they had when the virtual animated 3D lady storyteller talked about 'picking up the shaving razor to shave' in the narration of the story. In absence of prior knowledge of the *Dracula* narrative, it raised questions about why a female character was possibly talking about shaving in the first person. This I would argue is a confusion about the 'potentiality' of a character in the virtual world, which is strikingly different from that of a real human in a real background (for example a lady teacher) narrating the story in first person. While a real human being's potential to do things is well established and therefore we accept it as her narrating a story in the first person, a virtual 3D character has the potential to morph into a man (or for that matter into anything) and may therefore create undue narrative expectations or confusion thereof. A flickering flame in the physical real world will come with a set of established conventions about what a flickering flame can or cannot do, but the same flame when remediated into a virtual flame (either within a defined screen of a desktop/VR scenario/ hologram image) raises a different set of expectations. Ishii & Woolmer (1997) also acknowledge this phenomenon when they try to address the problem that our interactions with these Graphical User Interfaces are separated from the natural physical environment within which we live and interact and therefore posit the concept of 'Tangible User Interfaces' (TUIs) digital information will be coupled to everyday physical objects and environments. Isshii & Woolmer (1997) posit the idea of TUI as a more effective technology alternative against the domination of the GUI. But they stop short of connecting their idea to the constructs that define the emerging culture of virtuality.

Interface choices and the shifts of Presence

Having discussed the manner in which a broader understanding of the virtual culture (through the definition of virtual) may help us interface designers to look beyond the screen based interfaces or the conventional interfaces of virtual reality technologies, I will now focus on the way different media technologies aid different kinds of

'presence' and thereby build different cultures of 'presence'. One of the key factors for an interface designer while undertaking remediation is therefore to acknowledge these differential abilities of the technologies to aid presence in a particular way as immersion has been found to have direct relation to the degree of presence.

I used the concept of 'presence' earlier in the chapter to show how screen sizes and quality of images may affect 'presence' and thereby affect immersion. But I stopped short of elaborating on how presence is not in one singular form (unlike what most media technology researchers assume it to be) and different forms of media interfaces stimulate immersion through different kinds of presence. This difference in the kinds of presence experienced by a user is also a useful parameter for designers to make choices of technologies in remediation (like the one in this study) and post-trial analysis for future iterations. For this part of the discussion, I will use Ong's (1962) description of presence as the need to 'experience a living person and a need for communication' (p.8) and effectiveness of a given technology should also therefore be judged through that criterion of presence. Ong's work being mostly focused on orality and literacy, presence might have been seen in a limited sense that excludes the possibilities in a virtual culture where any living or non-living symbolic entity can also be imbued with human qualities of communication and can therefore give a sense of presence to human users. This broadened scope for creating 'presence' is compatible with my earlier arguments on the scope of 'potentialities' in virtual culture. This wider understanding of 'presence' can be an essential addition in the framework of understanding remediation with different technologies and applying appropriate assumptions for measuring presence and immersion.

This need to experience a living or non-living entity and the need for communication is manifested through different kinds of presence: primary and secondary and tertiary. Presence can be primary, secondary or tertiary in nature depending on the kind of media technology we use. Our ancestral primary oral culture had the technology of 'orality' where face to face presence was mandatory for communication (Shannon & Weaver 1949, Weaver 1949). The same changed to a sense of 'secondary presence' in literacy culture where the written text became the technology to communicate between the author (who is not present physically) and

the reader. Virtual culture is said to be one where tertiary presence is the next level of human communication. This sort of tertiary presence is seen when we participate in online chats or virtual reality video games where as avatars we are present in a virtual environment through our tertiary presence. However, the complexity of defining presence in the virtual culture arises out of the diversity of its technologies. Unlike earlier cultures of orality and literacy, presence can be any or all of the three in contemporary technology options.

In this study, when the 3D oral storyteller is seen through a desktop screen, the designer's intention through remediation is obviously to create a close-to primary presence as was the wont in primary oral culture. However due to the fact that the technology choice is that of a desktop computer with a limited screen space and the 3D animation resides within that, the presence is almost like that of a voyeur looking through the window frame of the desktop. In one way, it is close to the secondary presence experienced when reading the story of *Dracula* through a printed book. But it is different from the secondary presence in case of a book because the 3D storyteller narrates the story within the visual reach of the participant, unlike the printed novel where the author is invisible and his/her voice is only read visually through text.

The interface experience in this study is also different from the tertiary presence that one would have felt if the same 3D storyteller was seen in a virtual reality environment through a wearable where the participant would have been cut off from the physical real environment and felt his/her tertiary presence in the virtual reality environment. A hologram projection of the 3D oral storyteller in a room would have created primary presence as both the virtual storyteller and the participant in the study would have been in the same environment and simulating a face to face communication as it is in primary orality.

Expanding the definition of virtuality and using tangible interfaces like rugs, pillows and dogs as oral storytellers (as wished by several focus group participants) would have created primary presence but this requires us to appreciate a broader definition of the term 'presence'(as explained earlier), not limited to interaction with human entities only but also to any entity (living or non-living) that gives one the

feeling of being present in a given environment and the near-absence of the medium.

Without going into the details of the complete range of technologies which is beyond the scope of this study, one can realize that any effort at remediation in contemporary time throws up multiple media technology choices and each of these choices imply different experiences of 'presence' which would surely be qualitatively different from the other. Differences in presence would also have implications for 'immersion' that results thereof and also in the manner in which we gaze at and interpret entities in the content. The results from this study could well have been used to conclude that the quality of animation needs to be made more realistic in order to achieve a desired difference in immersion. While this is most often the conventional path of analysing media interface trials, the path that I am proposing would lead a designer to question the 'presence affordance' of a given technology or interface. A screen based desktop can only produce a presence that it is capable of through its affordance, and it can never be expected to deliver the same degree or quality of presence that a printed novel has provided. Either in the initial stage of design or in post-trial evaluation, it is integral to the design process to evaluate the kind of 'presence' that it is expecting to remediate and how that is positioned quite differently from any other media interface. This would be essential in avoiding 'an apple against an orange' comparison and also help in effective design of the measurement apparatus that throws up the data.

The Waiting Game and Scope for Iterations

An essential part of any design process is obviously a post-trial analysis of the results and iterations if necessary. However, the difference that the discussion so far was trying to make is in giving this post-trial analysis an analytical framework from different perspectives that cannot come merely from the quantitative data arising out of the study. But beyond all the different paradigms of possibilities that can shape the future iterations with a changed interface, there are also compelling reasons in favour of considering the results of this study as an 'outlier' and therefore considering further iterations with the same interface before any of the preceding possibilities are considered.

The history of remediation efforts, ranging from the transition of orality to printed books, printed books to e-books or from still photography to the movies, have thrown up certain consistent facts about technology adaptation. Every new technology has a period of novelty that wears off after a period of time. It is during this novelty period that people act in a way that may not be the desired intention of the technology designers. Cinema in its earliest days started off as a 'cinema of attractions' (Gunning 1995) and gradually came to fulfil its purpose of being the cinema of entertaining narratives. The story around the first screening of the film 'The Arrival of a Train at the La Ciotat Station' made by the Lumiere Brothers in 1895 revolves around how some of the audience ran away at the sight of the train entering the station. The audience was apparently so taken aback by the realism (transparent immediacy) of the scene that they behaved in an awkward manner. It is also argued by media theorists like Gunning that it was in fact not that the audience was fooled but the disjunct between the reality they knew and what they saw was hard to accept without an abnormal reaction. Seen in another way, this was hypermediacy (the awareness of the media as a magic) functioning at its supreme. The printed book in its initial days also saw people reading out loudly from the printed text instead of reading silently. Thus both cinema and printed books, like many other media technologies failed to garner a reasonable presence or immersion into the narrative and remained for some time as media of attractions. Neither the cinema nor the printed books lacked in any form of technological effectiveness. However, the overbearing presence of the new media had to be negotiated over a period of time till hypermediacy and immediacy struck a balance that was effective for critical levels of presence and immersion to settle in.

This may be very well the case with the interface design in this study where the presence of the 3D virtual oral storyteller along with its animated apocalyptic background evoked a sense of novelty. The eye-calibration activity at the starting of the session and the awareness of an eye-tracker consistently tracking the eyes was also a novelty for the participants and would have possibly played in the mind of the participants. This is to an extent shown by the fact that 13 out of 15 participants believed (in response to a written question) that the 3D virtual avatar of the lady storyteller was keeping constant eye contact with their eye, even though that was

not the reality. So, the data from this first attempt with a given participant may portray his or her reaction to the novelty, a form of hypermediacy induced reaction and less about the ability of the interface to induce immersion. Some of the research related to degrees of 'presence' also conclude that a user broad-focuses his/her attention on all aspects of the virtual environment when faced with the novelty, immediacy and uniqueness of the experience whereas a narrow attentional focus happens when one devotes all the attentional resource towards a selected area of the environment. This observation can be a very rational explanation of the lower value of immersion (though not significant) for the AVATAR interface in comparison to the NO-AVATAR interface. The AVATAR interface by the presence of the 3D avatar narrating the story had a novelty-quotient higher than the NO-AVATAR interface and this novelty may distort one's engagement with the narrative. The participants also had to negotiate the contextual connection of the avatar with the other elements in the background that were also virtual.

However, assuming that we carry out future iterations with unchanged interfaces and the same set of participants but with different stories and a different background in each iteration, the awareness of the media (hypermediacy) in form of novelty would progressively be reduced. Broad-focusing of the attention would also slowly move to a narrow-focusing of the attention towards the storyteller and the narrative of the content. In such a scenario, several changes in the audience behaviour and perceptions could potentially take place in quite a similar manner to other media technologies like the cinema in their initial phase. First of all, the participant's expectation from the different elements in the background (like walking man, gorilla or the fire) to play active roles in the story most possibly would cease to exist and they would have entered into a phase of a stabilised set of conventions with regards to where they focus for the consumption of the narrative. They would move from a broad-focusing to a narrow-focus response over a period of time. The participants would also potentially have a reduced awareness of the real-time eye-tracking as a conscious technological intervention. Thus the same interfaces (with changes of background and story) could throw up different results over a period of time and iterations as the terms of engagement with the new media become settled and the media evolves from an 'interface of attraction' to an 'interface of oral storytelling'.

This hypothesised scenario can be derived from the fact that a train moving into a station in a film scene no more evokes a shock reaction due to its realism but is seen in the context of the narrative.

The gaze of the viewer is thus subject to cultural adaptations to a given new technology and hence cannot always be a testimonial data for corrective action to be initiated on the interface. For an interface designer's purpose of evaluation and future path-mapping, it becomes imperative therefore to realize that factors like 'hypermediacy', 'immediacy', presence and immersion are dynamic parameters that can vary over time for the same individual or group through repeated use of the same interface. Though this part of the argumentation does not necessarily imply that the 'status quo' must be maintained with a given interface irrespective of its efficacy in a given trial, the interface trial in this study is a test case to show that conclusions about the efficacy of a new media interface have to go beyond the quantitative data of its usage pattern. While most design practices in a human computer interaction scenario have the tendency to take 'technology' as the only variable and human subjects as a constant value, I posit that 'human' subjects who form the part of a cultural milieu are not a constant over a period of time and are a variable subject to a cultural progression. Accounting for that variability of human beings which arises out of the past media cultures and the manner in which media conceptualises that reality has to be an inherent part of the design process or iteration planning. .

CHAPTER NINE

Conclusion: The Path Ahead

Determinism and Wickedness

This research was goaded by the overarching goal of teasing out the contributory matrix of factors that give shape to a media technology interface and also impact its reception by the users. In pursuing the underlying goal, an interface that remediated oral storytelling into a digital interface through a 3D digitally animated avatar was undertaken. Theories on determinism and remediation intersected with relevant design principles and concepts to reveal that an exercise in remediation is an inherently 'wicked design problem' lacking neatly formulated goals and solutions. Addressing a media technology design problem of such nature therefore necessitates interface designers to have an interdisciplinary approach in addressing the design problem. The interdisciplinary approach serves to plug some of the gaps in the strait-jacketed design practices by bringing into consideration a wider range of contributory factors that includes the pre-existing media cultures, the materiality of the technology affordances, and the roles of the designer/s and the users drawing from their personal frameworks of interpretation. While some of the conclusions in this study are direct results of the interface development experience, there are others that have emerged indirectly by applying a theoretical lens on the anomalies and contradictions in the results.

Implications for Media Technology Designers

The implications of the study for media technology designers derive principally from the realization that remediation design problems and solutions are not necessarily about the 'form' and 'function' of the product in a monolithic form. Use of a broader array of analytical tools as demonstrated in this study can help in understanding that media designs exist within a continuum of media evolution where the 'form' and 'function' of media design are not just a product of the designer's individual ingenuity. Following are some of the key conclusions that may inform and update the current design practices.

a. Remediation design problems are fraught with assumptions about the key variables like 'immersion' 'distraction' or 'presence' that are often used by media technology designers as the key indicators for evaluating the effectiveness of a design solution. However, these variables are impacted by the user's exposure to pre-existing media cultures and also by some limited exposure to the emerging media practices. The assumptions behind the measurement of these variables therefore need to account for their cultural sensitivities.

In this project, the results were reasonably indicative of the fact that eye-gaze and its correlation with immersion, may be different for a real-life oral storyteller in a real background as opposed to a virtual avatar in a virtual background. The assumptions about human eye-gaze and what they indicate are still in primary stage of research. Therefore any research that uses eye-gaze patterns to plot relative levels of immersion, distraction or presence should be wary of sweeping assumptions and drawing conclusions thereof. The assumptions about the efficacy of measurement tools (other than the eye-tracking) also may vary for different media platforms delivering the same content. The subjective measures like scaled questionnaires may also suffer from limitations as the assumptions inherent in their creation makes them more suitable for some specific media platforms as immersion or distraction is experienced in a different manner in different media formats (as observed in this project).

b. Choices and decisions made by the designer/s and the users are not specific to the functionalities of a technology but are also inherently cultural and therefore analytical evaluation of the technology design must account for the same. The cultural bias is also not restricted or limited to the immediate visible cultural practices but more often than not owe their origin to the pre-existing media cultures from which the new media has appropriated some of its features.

For example, the culture of screen-based media technologies has been prevalent for a significant amount of time and therefore the prevalent cultural practice is that of viewing the complete screen space as a constructed space with every part of it being created for a definite purpose (not naturally existing). The remediation of a live oral storytelling scenario into that defined screen space therefore creates a conflict between two different cultural practices. One is that of listening to a live

storyteller in a natural environment where every entity in the background is not necessarily created for the purpose of storytelling, and the other is of an artificially created screen space where every element is a matter of choice for the designer and therefore holds meaning for the user in the context of the storytelling, The act of delivering a novel that is a construct of literacy based culture through an oral storyteller also creates another level of conflict of cultural practice, as literacy based style of storytelling is different from orally delivered stories where repetitions and non-verbal cues from the storyteller impact the consumption of the story.

c. When technologies like desktop computers, eye-tracking and Unity software are used in combination (as done in this study) for creating a new media interface, the combination of their material affordances creates a unique set of 'immediacy' and 'hypermediacy' characteristics. Apart from their individual material affordances, they also bring into play their individual cultural implications which play a role in the reception of the interface and the content projected through it. Desktop computers ushered in a technology mediated 'immediacy' for work-related environments by making work documents and files as 'immediate' as possible in the virtual form. However, when the same desktop is used for projecting animated audio-visuals for story consumption, the limited screen space of the desktop creates an awareness of the media technology resulting in the experience becoming 'hypermediated'. This 'hypermediation' becomes more complex when the eye-tracker is added on to it as the eye-tracker creates its own awareness about the technology mediation amongst the participants. Thus each element of technology independently and in combination has a role to play in the way users would engage with the interface. This dissertation displays how taking cognizance of these immediacies and hypermediacies in technology choices and how they can swing the audience engagement with the interface is a key element of interface design.

d. The observations from the study provide an indicative proof for the theoretical assertions about the virtual culture being different from the other pre-existing media cultures in being contextual. The contextual nature of media consumption in turn arises out of the freedom in the virtual culture to discover the potentialities

of entities that may differ from their real-life information structure. This tendency of discovering the 'potential' existed even within the pre-existing cultures of orality and literacy which had the concept of the 'virtual' in oral or literary form but the diversity of contemporary technologies with required material affordances have the abilities to actualize that 'virtual' and has thereby brought it within the user's realm of possibilities. This realization not only broadens the understanding of the nuances of new media design and reception but also throws open the possibilities for future media technology design.

While the 'virtual' as potential was a matter of human imagination when we heard stories or read them from books in cultures of orality and literacy respectively, the contemporary culture of virtuality has attempted to actualize the virtual into the realm of our visual, aural or haptic senses. Though this process of actualization of the virtual is still in its early days, users have already encountered the virtual through their experience with virtual reality games, animated cartoons or digital animations in movies. Users would tend to use these past experiences consciously or unconsciously while trying to engage with any new media interface that has virtual elements as part of the interface. This parameter of existing or past media practices affecting the interaction with a new media interface needs to be accounted for in any remediation exercise in order to draw valid conclusions about the effectiveness of a new media initiative.

e. While achieving transparent immediacy through 'realism' has been the mainstay of remediation technologies across different media eras, the remediation in contemporary virtual culture does not need to be limited to the realistic representation of the original. Therefore the idea of 'transparent immediacy' needs to be viewed by media interface designers through the wider connotation of 'virtual' in the virtual culture.

Though the idea of 'virtual' as having the similar or comparable information structure as the original existed from the earliest eras of media culture, contemporary technologies have made it possible for these potential entities to be given definite visual existence. The 'uncanny valley phenomenon' described earlier gives a peek into the manner in which the correlation between 'realism' and audience engagement with a virtual character is not necessarily collinear and

that presents the interface designers with a 'wicked problem' scenario in interface design.

Implication for Media Studies

In this study, theories from the field of media studies were used extensively to broaden the paradigm of design thinking. However, in this process of applying the theories to the actual practice of design, the applicability of these theoretical models and their scope for advancement are also revealed. The juxtaposition of medium theory with social constructivism becomes a theoretical model in itself that can be used for future studies and also for corrective debates within these theoretical schools based on their applicability to digital remediation.

In this dissertation, based on the data from the focus groups, survey and the experiment it was argued that the medium theory's basic tenet about the medium making a difference to the user's consumption of stories holds true. E-books as a medium in contrast to the printed books or the virtual storyteller within a screen based interface in contrast to a live oral storyteller do make a difference to the user's consumption of stories. However, this dissertation argued that it was not only the nature of the medium but also the situational factors under which the interface designer conceptualizes the medium that have implications for the way it is eventually used and perceived by the users of the medium. The social, cultural and economic forces that influence the designers to shape the medium or the interface in a particular way and also colour the perception of the users towards the interface have been accounted for by the social-constructivist model of thinking. Thus some of the tenets of the medium theory when coupled with the social-constructivist model help the interface designers to reach a more balanced and nuanced analysis about a new media interface.

A special mention in this case is the connection that was made between the concept of 'wicked design problems' and the theory of remediation. The theory of remediation posits the concept of 'immediacy' and 'hypermediacy' as generic constructs in remediation. But the conclusions of this study show that these constructs have wickedness inherent in them. Though the theory of remediation holds true for the generic constructs of immediacy and hypermediacy in any act of

remediation, they are not static values that can be assumed for any new media interface. As was seen through the discussion on 'uncanny valley' phenomenon, the path to achieving immediacy is a complex wicked design problem with no definite equation to map it. The theory of remediation does mention in passing that immediacy and hypermediacy may often vary based on the social group, gender or even age of the users. However, for Bolter & Grusin (1999), establishing the primacy of these constructs in new media being the basic focus for their work, the scope of exploring and explaining their variability in diverse new media contexts remains to be explored. This dissertation through the context of the interface development and trial attempts to argue and establish this complexity inherent in the concepts of immediacy and hypermediacy.

The process of remediation has also been seen in this dissertation through the characteristic features of orality, literacy and virtuality as posited by the medium theorists. While the features of these media cultures have been in the public domain due to earlier research by medium theorists like Ong, this dissertation makes an initiation in mapping these features to actual conversations around different media technologies used for storytelling. Through the analysis and the discussions on the experimental data, the medium theory's postulates about virtual culture in certain aspects are validated and enriched through the understanding of the concept of 'potentiality' as applied in a specific virtual culture medium.

This study uses the relevant theories from the field of medium studies as a tool to explain the micro-phenomena in a human computer interaction scenario. In the process, 'medium studies' as a body of work establishes its usefulness to the field of human computer interaction. Some of the most relevant theories in media studies like the medium theory came into prominence at a time when the digital media technologies were yet to appear. The theoretical tenets of the medium theory was much later applied to the new media situations in the form of the theory of remediation by Bolter and Grusin (1999). This dissertation builds up on the idea of remediation and the original foundation of medium theory to extend its application to the complexities inherent in explaining human computer interaction.

Limitations of the Study

This research however has certain limitations that arise out of the material constraints and also from the limitations of my knowledge as a researcher at the beginning of the study. The experimental design could have benefited by the addition of a layer of detailed post-trial structured interviews with the participants. This would have acted complementary to the post-trial structured questionnaire that was used. The difficulties of getting adequate time commitment for such an exercise reduced the depth of analysis.

The scaled questionnaire itself has limitations in measuring immersion as immersion may not be experienced in the same manner for different media formats or different media technologies. In the absence of a scaled questionnaire that is specifically meant for an interface with virtual storytellers or even a live oral storyteller, the questionnaire was adapted from one that was developed primarily to measure immersion for movies. This is a methodological perspective that could be made more efficient if the measurement of immersion could be made more efficient through development of scaled questionnaires that are specific to a media platform.

The short duration of narration in the interface experiment for a 3 minute excerpt could also be a limiting factor in understanding and gauging immersion, as immersion may often take a longer time to crystallize in a storytelling session. In future experiments with similar experimental set-up, there should be emphasis on a more rational choice of duration for the storytelling session.

The script of the narration being an excerpt from a published and popular novel *Dracula*, prior knowledge of the narrated excerpt amongst some of the participants may influence the results. Those with prior knowledge about the novel may have a relatively higher level of understanding than those who had never read the story and that might have a cascading effect on the results. This aspect of the limitations also leads to a realization that remediation experiments of this nature could add depth to their analysis by having detailed socio-cultural data of the trial participants to draw necessary links between their reception and their cultural background.

As discussed earlier, the focus groups had uneven number of participants and would have been more effective if each of the focus groups had 5-6 participants.

The coding of the focus group data based on Dempsey's (2014) matrix should also be ideally carried out by multiple analysts to lend more reliability and robustness to the conclusions from the data.

Lastly, the study chooses to stay limited within certain selective cultural variables as a contributory factor in remediation though there are other variables like economic or political forces that may also play a role in the way a technology shapes up and is received by the users.

Future Directions

Firstly, the limitations of the study as discussed earlier are obviously the first corrective steps that future research could take for adding further depth in the analysis. Future research could carry out the iterations of the same interface with different content to measure variability of the user's reception of a remediated interface with time. The avatar in its current form is not multi-modal in communication as it lacks the use of gestures that typify the delivery style of an oral storyteller. A higher quality of rendition of the avatar is also key to understanding the variable impacts of remediation in terms of 'immediacy' and 'hypermediacy'. This study opens up the possibilities of using the same analytical model with other non-screen based technologies like laser holography and tangible user interfaces. Non-screen based technologies reduce the awareness of the medium itself and thereby tend to provide a heightened sense of immediacy. The user's engagement with the virtual entities can also be expected to be different than that with the virtual entities situated within a screen. Taking this study as a starting point, it will be useful to conduct similar experiments with other emerging non-screen based technologies. Use of these new emerging technologies will reveal the differences in the way various technologies create differences in the wickedness of a remediation design problem and reveal the contributory factors behind their development and reception. While social-constructivist school of thinking have a body of work on different technologies ranging from bicycle to bakelite, bulbs and dishwasher, there has been little or sparse work in tracing the socio-cultural factors in the development of virtual culture technologies. This study makes a partial attempt in using social-constructivist model of analysis to explain the shaping of the interface and the model

does help in explaining a significant number of developmental issues in remediation. However, research goals that are more focused in using social-constructivist theory as its primary methodology will serve to unravel the developmental stories of many of the new media interfaces in the virtual culture that are using technologies like augmented reality, virtual reality or 3D laser simulation.

One of the interface design concepts that has become a useful tool in interface development is that of 'persona' development. A persona is a fictional characterization of the typical and the most likely user of the interface. However, the concept was consciously avoided in this exploratory research project as this interface development unlike the commercial projects was not being done with a defined consumer profile in mind. Also, due to lack of precedence for virtual oral storytellers and the user preferences for the same, the research focused more on gathering a broad range of data from diverse undefined users through the preliminary prototype. However, future research may gain from defining personas for interfaces with virtual oral storytellers, both for the users and the virtual storyteller. In a way, it would help in mitigating the indeterminateness of the design problem by detailing the assumptions about the user profile and the virtual storyteller's persona. It would also help one to refine the conclusions from the data as remediated interfaces (as discussed earlier) may have different implications for different sets of people due to differences in class, income, gender or other demographic and socio-economic factors.

Last but not the least, this research hopes to provide an impetus for future researchers in the field of media and design to carry out interdisciplinary research that not only bridges the gap between these two disciplines but also adds robustness to their respective theories and practices.

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APPENDIX ONE

Script for Storytelling Audio Track:

Now you are all clear to hear the story from me, the Menomsyne. I only slept a few hours when I went to bed, and feeling that I could not sleep any more, got up. I had hung my shaving glass by the window, and was just beginning to shave. Suddenly I felt a hand on my shoulder, and heard the Count's voice saying to me, "Good-morning." I started, for it amazed me that I had not seen him, since the reflection of the glass covered the whole room behind me. In starting I had cut myself slightly, but did not notice it at the moment. Having answered the Count's salutation, I turned to the glass again to see how I had been mistaken. This time there could be no error, for the man was close to me, and I could see him over my shoulder. But there was no reflection of him in the mirror! The whole room behind me was displayed; but there was no sign of a man in it, except myself. This was startling, and, coming on the top of so many strange things, was beginning to increase that vague feeling of uneasiness which I always have when the Count is near; but at the instant I saw that the cut had bled a little, and the blood was trickling over my chin. I laid down the razor, turning as I did so half round to look for some sticking plaster. When the Count saw my face, his eyes blazed with a sort of demoniac fury, and he suddenly made a grab at my throat. I drew away, and his hand touched the string of beads which held the crucifix. It made an instant change in him, for the fury passed so quickly that I could hardly believe that it was ever there. "Take care," he said, "take care how you cut yourself. It is more dangerous than you think in this country." Then seizing the shaving glass, he went on: "And this is the wretched thing that has done the mischief. It is a foul bauble of man's vanity. Away with it!" and opening the heavy window with one wrench of his terrible hand, he flung out the glass, which was shattered into a thousand pieces on the stones of the courtyard far below. Then he withdrew without a word. It is very annoying, for I do not see how I am to shave, unless in my watch-case or the bottom of the shaving-pot, which is fortunately of metal. When I went into the dining-room, breakfast was prepared; but I could not find the Count anywhere. So I breakfasted alone. It is strange that as yet I have not seen the Count eat or drink. He must be a very peculiar man!

Pre-Focus Group Questionnaire

Gender:

Study Major:

Age:

1. What format of stories do you consume most regularly?
   a. Short stories
   b. novels
   c. comics
   d. movies
   e. Plays
   f. T.V program

2. How often do you read a novel?
   a. One or more than one a week
   b. One in two weeks
   c. one in a month
   d. one in six months
   e. one in a year
   f. almost none

3. Out of all the novels that you've read in the last one year approximately what percentage were
   a. Print novels.
   b. E-books
   c. Audio books

4. When you think about a story, which format do you prefer? Please rate your comparative liking for each in a scale of 1 to 5.
   a. Printed novel
      Lowest   1 ------- 2 -------3---------4----------5 Highest
   b. e-book
       Lowest   1 ------- 2 -------3---------4----------5 Highest

   c. 2 D movie
      Lowest   1 ------- 2 -------3-------- 4----------5 Highest
   d. Theatrical performance
      Lowest   1 ------- 2 -------3---------4----------5   Highest
   e. 3-D movie

Lowest   1 ------- 2 -------3---------4----------5 Highest
- f. Audio book
  Lowest   1 ------- 2 -------3-------- 4----------5 Highest
- g. A good narrator telling the story live to you.
  Lowest   1 ------- 2 -------3---------4----------5 Highest

5. In the above choices, why do you prefer a particular format the most? Give a short reasoning.
6. If your choice is (f) or (g) then what makes you choose 'hearing a story' instead of 'reading it'?
   a. Don't have patience to read
   b. Feels better to listen than to read
   c. I absorb and remember a story far better when I listen to it
   d. Any other reason, please mention

7. If you are travelling, which format would you prefer to consume a story?
   a. Reading a printed novel
   b. reading an e-book of the novel
   c. listening to an audio-book format of the novel

8. If you preparing to go to sleep, which format would you prefer to consume a novel?
   a. Reading a printed novel
   b. reading an e-book of the novel
   c. listening to an audio-book format of the novel

9. When you think of hearing a story being told live by someone to you, whom do you think of
   a. Your grandma/ grandpa/ father /mother
   b. some professional storyteller
   c. your teacher
   d. someone else (please mention)

10. What aspects of the oral storyteller do you think are the most important to you? You can mark more than one option
    a. The look of the storyteller
    b. The voice quality
    c. The facial expressions
    d. The emotions with which the teller narrates the story
    e. The props that he or she uses…for example making you smell a particular perfume that revealed the murderer.
    f. Interacting with the listener and understanding the points at which the listener is confused or has a question or feels certain emotions.

g. Interacting through touch, eg. Touching you by hand or with an object that can enhance the effect of the story.

11. If one of your favourite novels could be told to you by your favourite storyteller, which novel would you choose?

12. Do you feel that stories in novels can be much better comprehended and impactful if someone orally narrates the story?
    a. Yes
    b. No
    c. Maybe

13. If you compare 'audio books' with a 'live oral storyteller' telling the same story, which would you prefer. Show your relative preference by marking a cross on the line between the two. A cross in the middle means that you have equal liking for both and closer to one of them means that you have that degree of preference for the one which is close.

AUDIO BOOKS…………………………………………………………………ORAL STORYTELLER

If you have never heard any story orally, please mark NA.

14. Please rank the following factors about oral storytelling in their order of importance.
    a. The voice quality
    b. The facial expressions
    c. The emotions with which the teller narrates the story
    d. The look of the storyteller
    e. Interacting with the listener and understanding the points at which the listener is confused or has a question or feels bored.
    f. The props that he or she uses…example showing you the kind of jewellery that the character had used.
    g. Interacting through touch, for eg. Touching you by hand or with an object that can enhance the effect of the story.

15. Please mark the extent to which you agree or disagree with the following statements:
    a. E-books are just a digital copy of the printed books

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

    b. Printed novels make me feel that I am reading a novel, but e-books do not

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

    c. E-books are like food pills, while printed novel is like the real food

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

d. I love dog-earing the pages of a printed novel
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

e. The only thing that I miss in an e-book novel is the feel of the pages and holding the novel in my hand.
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

f. E-book novels make me far more engrossed in the story than print books ever can
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

g. I love doodling and writing small notes while I read a printed novel
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

h. When I say a novel, I always mean a printed novel
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

i. I can't gift e-books, or store them as a memory of my past, I miss that
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

j. The e-book reader as a device distracts me when I really want to be engrossed in a serious novel
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

k. E-books are good for academic texts, not for novels
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

l. Reading a novel is a personal experience, e-books can't give that
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

m. It doesn't matter whether I read in e-book format or printed, a novel is a novel
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

n. I love to smell the book
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

o. I love the feel of turning the paper pages as I read the novel
Strongly disagree…….disagree…….neutral……..agree……..strongly agree

p. I love the covers of the novels and the illustrations get me in the mood

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

q. I love to see the books grow old and the pages turn yellow

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

r. I often judge people in public places by the cover of the novel that they are reading

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

s. I love to see the novel that I am reading lying on my table or in my shelf.

Strongly disagree…….disagree…….neutral……..agree……..strongly agree

16.

Please feel free to offer any vital idea that this questionnaire has missed.

APPENDIX THREE

Post Interface Trial Questionnaire

Gender :   *Age :*   *Study major:*

Please rate how far you would agree with the statements below based on the story excerpt that you have heard just now.

1. At points, I had a hard time making sense of what was going on in the story.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

2. My understanding of the characters is unclear.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

3. I had a hard time recognizing the thread of the story.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

4. I found my mind wandering while the narration of the story was on.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

5. While the story was on I found myself thinking about other things.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

6. I had a hard time keeping my mind on the story

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

7. During the story narration, my body was in the room, but my mind was inside the world created by the story.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

8. The story created for a brief time the fantasy world of horror, and then that world suddenly disappeared when the narration ended.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

9. At times during the narration, the story world was closer to me than the real world.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

10. The story excerpt affected me emotionally to the extent that I could feel the tension in the situation.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

11. During the story narration, when the main character succeeded in escaping narrowly from the clutches of Dracula, I felt relieved.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

12. I identified with the situation of the protagonist in the story and would have felt the same kind of uneasiness in the eerie situation.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

13. I was unaware of what was happening around me

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

14. I was aware of the surroundings

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

15. I felt detached from the outside world for the short time of the narration

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

16. I still felt attached to the real world outside the story narration

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

17. I would have liked it if the narration continued further for some more time.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

18. The story session was interactive

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

19. I like storytelling or reading to be always interactive.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

20. I was not distracted at all by the surrounding noise while the narration was going on.

STRONGLY DISAGREE…….DISAGREE…….NEUTRAL……..AGREE……..STRONGLY AGREE

21. There was a distracting visual on the computer screen that distracted me from listening to the story at one point.

STRONGLY DISAGREE

DISAGREE…….NEUTRAL……..AGREE……..STRONGLY   AGREE

22. What did the man look for in order to stop the cut from bleeding?

23. Where did the shaving glass fall after it was thrown out?

24. Did you notice a gorilla during the storytelling session?

25. Did you notice a man wearing a black coat walking across in the background?

26. I think the narration of the story excerpt lasted for approximately (You can mark anywhere in between the options).

     1min---------2min-----------3min-------------4min-------------5 min--------6min

27. How immersed in the whole story did you feel while you listened to this short excerpt from Count Dracula?

     0-----1------2------3------4------5-----6------7------8-----9-----10

         0—not immersed   10- very immersed

28. If you noticed the gorilla, how distracted did you feel by the gorilla?

0-----1------2------3------4------5-----6------7------8-----9-----10

         0—not distracted   10- very much distracted

29. If you noticed the man walking by in the black coat, how distracted did you feel?

     0-----1------2------3------4------5-----6------7------8-----9-----10

         0—not distracted   10- very much distracted

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