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“Playful Cultural Learning”

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1 EXECUTIVE SUMMARY

This is one of two deliverables delivered in M24 of the MASELTOV project by COV, who are leading the development of the serious game. In this deliverable, we take a broad view of the context and design of a game devised for migrants around the concept of playful cultural learning. Dialogic interactions between avatars and characters in the serious game form a basis for persuasive learning, discussed in the accompanying D7.3.

The deliverable reflects on the challenging nature of developing a game intended to hold intrinsic appeal for a diverse audience, stimulating their engagement with cultural issues. This includes the description and exposition of key game design elements, including scenario design, content development, and progressive difficulty, allowing players to develop and apply their cultural understanding as they play. In presenting a game which draws on narrative, empowerment, and abstraction to convey targeted learning outcomes around the themes of cultural awareness, competence, and understanding, the deliverable seeks to provide a background to the development of a playful cultural learning environment, and discusses its integration with the wider MASELTOV platform.

2 INTRODUCTION

Game-based learning has been shown to work in a wide range of contexts (Zyda, Mayberry, Wardynski, Shilling, & Davis, 2003), including cultural learning (Johnson, 2009). However, as with any instructional medium, differences in audience, context, and representational medium each demand individual design considerations. This in turn creates a challenge in translating research outcomes, which typically analyse the efficacy of an individual game, into generalisable findings. Thus, for any serious game development project such as that undertaken by COVUNI within MASELTOV, careful initial consideration of viable pedagogical models and corresponding game design elements is essential.

In Section 3, we present more broadly the background context against which the MASELTOV game is developed. We note that in particular, the online "free-to-play" usage context through which the game ultimately seeks to reach its target audience is a competitive marketplace, and stimulating uptake requires a combination of engaging gameplay, aesthetics, and careful and informed deployment. One purpose of the use of a serious game within the MASELTOV project is to reach audiences who may not engage with more formal methods of instruction, or contact NGOs on a regular basis. To reach these audiences requires a game which is not simply a "gamification" of existing instructional material, but which approaches the challenge in a new format, allowing for playful cultural learning.

Our approach to designing this game is outlined in Section 4. The game draws heavily on the use of dialogic interactions between player and non-player character (NPC), outlined in further detail in D7.3. Therefore this deliverable seeks to document the design of the game and the rationale behind this design in more general terms: the pedagogical design draws from Hofstede's cultural framework to present two cultures to the player, and give them a broad range of challenges which require understanding these two disparate cultures. Considering the marketplace, investment is made into creating a level of visual fidelity in a 3D environment, creating a game-based look and feel.

Accurately simulating a cultural interaction in a form which allows for effective learning has the potential to draw a wide range of criticisms: for example, can we genuinely claim to represent English culture through a character who is apologetic? To avoid these criticism surrounding the fidelity with which these cultures are presented, a route is taken which capitalises on the game-based nature of the solution to apply abstraction and fiction against Hofstede's framework, generating a design which seeks to communicate a general understanding of how and when cultural differences can prove a barrier to integration.

This is intended to integrate with the wide range of services and NGO resources within the MASELTOV project, allowing the learner to traverse from high-level understanding of cultural differences achieved through the game, to lower-level skill-set development through the use of other MASELTOV services which provide more formal and specific educational content. The integration with these other services is detailed in Section 5, showing how tools such as the in-game journal can be used to record learning outcomes and link them to additional tools and resources within the project. Furthermore, the notion of 'mixed reality challenges' provides a platform upon which to build a technically-lightweight but pedagogically rich integration between tools such as AR Navigation and the Mobile Text Lens, incentivising their use via in-game currency which may be used to upgrade the player character. In concluding, Section 6 discusses the challenges in deploying the game and performing research 'in the wild' with real end-users, alongside the NGO-based evaluation, which for the game more than other services, may not be reflective of the target user base (as these migrants are likely already aware of and using NGO services).

This deliverable is accompanied by a working prototype of the game available as an Android APK (~100mb). Additional technical reference material and screenshots from the game are included as Appendices.

3 BACKGROUND

A principal research challenge surrounding current game-based learning interventions is not establishing *if* they work, as a wide range of evaluations have shown this; rather, the challenge is understanding *how* they work and translating this understanding to new designs. For any given context, asking the suitability of a game as a tool for attitudinal and behavioural change is akin to querying whether a book would be a solution: the simple answer is it depends on the design and content.

That said, some recurrent themes emerge from the literature on the general best practices for the application of digital games to address attitudinal and behavioural issues. Zyda states his position clearly: that games must recognise and place entertainment and "fun" at the forefront rather than pedagogical material (Zyda, 2007). Yet, as many games take instructional material as a starting point and seek to introduce game elements, often the balance is towards this pedagogical content at the initial stages of design and development. This in turn places constraints on the capacity to research and iterate the impact of games - if initial versions fail to engage and stimulate uptake, the size of the end-user base or need for out-of-context laboratory evaluations can limit the ability to understand impact and respond. Hence, there is an argument for focusing heavily on entertainment aspects: aesthetics, usability, game mechanics, and narrative during early stages, on the basis that if a game successfully attracts

and end-user base, it may be evolved over time in collaboration with these users through a process of participatory design to strongly address learning requirements.

Another recurrent theme is the need for collaboration between a wide range of stakeholders through the development process. Developing digital games requires a game and pedagogical designer: rarely does a single individual possess both skill-sets, and the "tension" (Isbister, Flanagan, & Hash, 2010) between game and instruction requires careful negotiation between the two fields. Furthermore, stakeholders include members of the target audience, subject matter experts, and researchers, as well as the individuals responsible for translating a design concept into a functional prototype, which requires both artistic and technical skills. Participatory design is often advocated, but difficult to implement (Lukosch, Ruijven, & Verbraeck, 2012), in particular as individuals can often report subjectively if a game is "fun", though self-reporting of learning, and in particular impact on attitude, can deviate significantly from objective observations of resultant behaviour (Raybourn & Bos, 2005). As with any software development project, there is little question that user involvement and testing can provide good feedback on usability and perceived usefulness, two important metrics when seeking to anticipate technology uptake and adoption (Rodrigues, Costa, & Oliveira, 2013). Hence, the MASELTOV project has utilized frequent end-user testing on-site at NGOs to assess this.

Moving more to the specific theme of game-based cultural learning, a range of demonstrators and prototypes have emerged which seek to apply technology and games to address the theme of inclusion and cultural understanding. Several have adopted an entertainment driven approach: using music (Wang, 2007) for example to convey and understand culture. Others have sought to utilise the game itself as a research tool allowing insight to be gained into users cultural views and understanding (Warren, Diller, Leung, Ferguson, & Sutton, 2005), the challenge here being how to feed research findings back to the end-user to support learning. Game based learning often seeks to create a "flow" experience (Cziksentmihalyi, 1990); in this, the learner is constantly in a state in which the level of challenge is commensurate with their level of ability. Effective feedback, particularly in an autonomous form, requires understanding of this level of performance and the ability to provide feedback which is supportive of the flow experience (Barnes, Powell, Chaffin, & Lipford, 2008). For cultural learning, this is a particular challenge as assessing unobtrusively an individual's level of cultural competence is difficult, furthermore, behaviour in game may not equate to real-world competence, as subsets of learners described by Kolb as "intuitive" (Kolb & Fry, 1975) tend to demonstrate learning through deliberate error and observation of consequence. Games often have intrinsic value in allowing players to observe the consequences of poor choices, and attempting to synchronize evaluation with gameplay, such that all players are in a constant assessment cycle, can detract from this capacity to explore.

Other examples of games being applied for cultural learning include their application to transfer an understanding of heritage (Bellotti, Berta, Gloria, D'ursi, & Fiore, 2013; Coenen, Mostmans, & Naessens, 2013); in these, informational content is given an immersive or gamified aesthetic with the intent of making it accessible and engaging for younger generations. Evaluations have shown efficacy in this area in terms of learning transfer, though anticipating the impact of this learning on inclusion and sense of identity remains a topic for research. As a number of other European projects exist in this space (Amicis, Girardi, Andreolli, & Conti, 2009), a clear vision for MASELTOV is to translate cultural learning through playful, present scenarios, rather than a historical route.

The emergence of devices such as the Kinect have also led to more physical games being developed to assess cultural competence, either using machine vision to observe and understand learner's responses, or test their ability to deliver appropriate gestures (Rehm, Leichtenstern, #246, Plomer, & Wiedemann, 2010). The challenge here is to translate effective gesture recognition, to effective learning outcome. Responding correctly in a given situation, for example accompanying a greeting with a certain wave, handshake, or bow, is difficult to translate to ubiquitous rulesets which are "correct" for a diverse range of situations. Hence, detecting the gesture correctly is only a solution to the technical aspect of this problem - efficacy demands the pedagogical aspect be developed and evaluated. In attempting to apply technology directly to assess and feed-back on competences, a potential for negative transfer also emerges; if a learner is assured by a system their competence is "excellent", then the system itself must be capable of demonstrating validity when these competences are taken into the wild.

Taking a wider view of cultural learning, one standpoint suggests that some cultural learning can be supported during foreign language teaching, and lists examples that may be integrated in lessons such as family life, humour, population and religion (Cakir, 2006). However, not all cultural differences can be taught in a classroom setting, such as attitudes or behaviours. People visiting another country may notice that some differences can only be observed when experiencing the culture in real life, things which were not easily taught in the classroom. Certainly, Hall and Toll write that after spending some time in a new country, a person may suffer from 'culture shock' and revert to only using attitudes and behaviours from their native culture, rather than adapting to the attitudes and behaviours of the new culture (Hall & Toll, 1999). Whilst it is difficult to teach these cultural differences in a classroom, it is necessary to prepare individuals to expect cultural differences, and to encourage continuous cultural awareness and adaption in order to strive in a new community.

Cultural awareness is a popular topic in occupational and educational research, as methods continuously developed to increase staff recognition of cultural differences in order to develop 'intercultural competence', which can improve their ability to interact with culturally diverse individuals (Graham & Richardson, 2008). These methods can be modified for any group who wish to engage with people from different cultures, including those who plan to move to another country. The literature supports the use of games as a method to engage individuals in cultural learning and to raise cultural awareness (Graham & Richardson, 2008; Meltzoff & Lenssen, 2000; Rousi, 2007). Some benefits of using games for cultural learning are explained by Graham and Richardson (2008), who write that games can provide a safe and structured environment for learning, and go on to say that in this safe environment a player can appreciate the variety of experiences connected with individual and group similarities and differences. By using a game, learners can be made aware of cultural differences throughout their play time, and be able to return to the game at any point to scaffold their learning, an option which would be unavailable when using methods such as classroom teaching. Learners will be able to experiment and test boundaries during their play time, unlike the restrictive boundaries of a classroom or the risk of making a mistake in real life.

Evaluating the use of games for cultural competence, Graham and Richardson (2008) write that a game should provide the player with the safety to reflect on their in game actions and their consequences, in order to develop an 'organic' understanding. Certainly, young learners report that they believe games are their best teachers (Prensky, 2003). Rather than being

taught cultural awareness theory in a classroom or training, a learner should be given the opportunity to naturally harvest their own understanding of cultural differences through executing actions, being given the opportunity to evaluate the outcome, and further their understanding with the ability to practice what they have learnt in safety. These features, coupled with strong cultural theory, will provide a game in which learners observe a variety of cultural differences, allowing them to become culturally aware and confident in adapting to new cultural experiences.

Consolidating this background results in three considerations reflected in the design in Section 4:

- Feedback and assessment must strive to generate a "flow" experience, with engaging gameplay at the forefront. This is a particular consideration for MASELTOV, as the exploitation of project outcomes requires a sustainable presence in marketplaces such as Google Play. To achieve this, community formation and support in evolving and improving the intervention over time may hold more value than an overtly educational approach which fails to capitalize on the engaging and motivating aspects of gameplay.
- Direct simulation of cultures and subsequent assessment of competences requires a high-level of fidelity in how this culture is simulated. In particular as subtle nuances in behaviour can result in different interpretations of interactions, to date no simulation-driven approach has generated compelling evidence of efficacy on a pedagogical level through a large-scale evaluation via method such as RCT.
- Effective learning requires a clear pedagogical framework be implemented alongside, and balanced with, game design. As the game for MASELTOV is developed drawing from experience across a consortium which includes partners with first-hand experience working with immigrants, stakeholder representation and involvement is key to effective design. However, understanding the target audience is equally important: evaluations based at NGOs may offer some insight into usability, but are only partially representative of the game's target audience, as immigrants who fail to engage with NGOs are at a higher risk of cultural exclusion. As a recent ISFE report¹ showed, around 25% of Europeans describe themselves as "gamers", and tapping into this audience to reach immigrants who may not be aware of how and when cultural differences can arise will broaden the overall reach of the project.

Bringing these considerations together, the next section illustrates how the game is designed to address these criteria and to respond to several of the research questions raised.

4 GAME DESIGN

The previous section outlined several emergent considerations from background literature when approaching the game's design. From a research standpoint, emergent challenges can immediately be observed. The following section frames two such challenges in the form of research questions, utilising these to drive the design process in Section 4.2. In Section 4.2, the narrative of the game is presented, as well as the outline of the design intended to address

¹ Interactive Software Federation of Europe (2012) Video Gamers in Europe. Available online at <http://www.isfe.eu/videogames-europe-2012-consumer-study>

these research challenges. The pedagogical design described in Section 4.3 seeks to blend with the game design, allowing a space for playful cultural learning to be created. Supporting this, Sections 4.4 and 4.5 describe the technical work undertaken to create the environment and backdrop of the game. Research Question 2 in Section 4.2 introduces the notion of using in game currency as social capital; Section 5 demonstrates how this can be utilized as a means for integrating and incentivising the use of other MASELTOV services.

4.1 RESEARCH QUESTIONS

As a research project, it is important firstly to define clear research questions which we seek to address through the game's design. To this end, the following questions are posed:

4.1.1 HOW CAN WE PROVIDE AND EVIDENCE 'PLAYFUL' CULTURAL LEARNING IN A SERIOUS GAME?

There are two parts to this question, though as they are highly interlinked, they have been left combined in this research question. The first is how we design and implement a model of playful cultural learning; the second is how we evidence that it works. To address the first question of design, we build upon known evidence of approaches that work, as well as those which fail. As noted in Section 3, stakeholder involvement, participatory design, and a healthy degree of iteration are beneficial. The challenge is enacting these in a situation where resources are finite, and polished solutions are often better received by end-users than more functional but prototypical systems.

Our approach draws from both literature and practical experience. On the one hand, we identify a pedagogical model to underpin the learning component of the game - i.e. define what we intend to teach - in this case Hofstede's cultural framework. We then identify an appropriate pedagogical approach again based on evidence and experience.

We do this in a 'four dimensional' approach that considers learners, their context, the representational medium, and pedagogical selection (Dunwell & de Freitas, 2011). We can see here that for learners within the demographic defined by MASELTOV, namely migrants with low language skills; complex or text-heavy games are therefore undesirable, as is something that may offend due to various cultural sensitivities. We also have the notion of an 'incidental' or 'on demand' approach to gameplay, therefore the context is informal and we must compete with other recreational activities to engage the user in this period. This is a primary driver for focussing heavily on the 'fun' aspect of the game - this is not something we can rely on a teacher or other third party to motivate people to use. This is also a reason why mixed reality aspects are best left as optional activities - the ISFE report noted in Section 3 showed less than 1% of gamers use mixed reality games. To limit the prototype to just this audience would appear an unacceptable reduction in potential reach and research impact, as larger numbers of users would be required for generalisable user study. For representation, the project neatly provides the constraint of an Android device.

Pedagogical selection must reflect on these constraints. Because of the need for an intrinsically motivating and fun game to match the context, a simulation or content-heavy approach would be unlikely to gain substantial users. The nature of the learners means we wish to favour abstraction, both to address the wide range of cultures MASELTOV targets, as

well as avoid any issues that arise from painting the user as a stereotypical 'migrant' or suggesting any cultures are inferior/superior. We need this to fit the usage patterns of a mobile game.

Relevant pedagogies, therefore, would include those stemming from Vygotsky's work on abstraction and play (Vygotsky, 1970), as well as those of Kolb (Kolb & Fry, 1975), regarding learning through experience - though noting the need to carefully scaffold the reflective process to accommodate the abstract nature of the experience), and theories of how to create high-engagement situations such as Csikszentmihalyi's 'flow' experience (Csikszentmihalyi, 1990). This flow is described as coming from a combination of close match between learner ability and task difficulty, supporting through a rich feedback system. Games in general tend to excel at rapid positive feedback cycling, and to create the level of engagement seen with successful mobile games based on simple high-frequency positive feedback models (e.g. Bejeweled), we should be aware of the need to create a strong element of entertainment content.

To address the second question of evaluation, qualitative and quantitative techniques both have relevance. Entertainment game developers have long been taking advantage of the rich data capture that can be achieved through mobile devices, and accomplishing similar data capture ethically and relating it to serious impact is a key objective for serious game researchers. In MASELTOV, we hope to gain quantitative data both through the field trials and live deployment of the game on Google Play. Feature use, route in and route out, exposure time, geolocation, and patterns of play would all be of research value given a sufficient sample for generalisable results. Smaller scale qualitative work at NGOs can support (or refute) the serious impact of the game.

The game itself is developed via agile component-based rapid prototyping on the Unity platform. Iteration is supported by delivery and evaluation in Y2-3 before further development; earlier iterations have provided some insight but are limited as a consequence of the incomplete nature of the game. In the longer-term, the research dimension will be a combined approach collating data on the usage and users of the game when live on Google Play, and comparing its quantitative analysis to the qualitative outcomes of user study within NGOs. Coupling these results may hopefully allow quantitative evidence of uptake to be supported by qualitative evidence of impact on the individual; however, it would be hoped usage might also lead to some quantitative metrics of impact as noted in Research Question 2:

Models for serious game design which go beyond advocating participatory and iterative design, and provide concrete guidelines for early stage development are rare. It would be hoped that successful evidence of impact can be used to validate the development approach taken, and allow for publications on a formalized version of the design framework on both pragmatic and pedagogical levels. This would have impact and value for any developers or stakeholders in the early stages of serious game development projects.

4.1.2 CAN VIRTUAL CURRENCY BE USED AS SOCIAL CAPITAL IN A "FREE TO PLAY" SERIOUS GAME?

Commercial games deployed on mobile devices are increasingly adopting a 'free to play' model, where the game itself is free to download, then additional content, upgrades, or in-game currency (which can be spent on bonuses either cosmetic or practical), is charged for. A

key benefit of this approach is the maximization of the potential user base, as there is no immediate barrier to entry, and a base of entertained players can provide a valuable marketing resource. To sustain player engagement, credits are typically earned through either playing the game, or directly purchasing them with real-world money. This supports both 'hardcore' players, who are worth supporting for free as they evangelize the game, and short-term players who are cash-rich and time-poor.

This model is equally appealing to serious games, which are often free of the constraint of needing to generate sustainable revenue. However, in this context, can the 'payment' from the user instead take the form of positive behaviours?

We intend to explore this in MASELTOV through the creation of a virtual currency of 'MASELTOV credits', shared between services. An in-game store will provide purchasable upgrades, such as:

- The cosmetic virtual MASELTOV hat, t-shirt, boots, etc.
- Functional items usable in the platform levels (jump boots, parachutes, speed upgrades, coin rate gain upgrades)
- Potential content unlocks (higher difficulty settings with larger rewards)

In terms of behavioural impact, the rapid way to gain large amounts of credits will not be to purchase them, but to instead participate positively in the MASELTOV project, for example:

- Posting a helpful response on forums
- Populating the wiki with content
- Helping a migrant using the geosocial radar
- Translating certain terms with the mobile text lens (the aim here is to make the user aware the service exists and how to use it)
- Using the context awareness system to face various challenges (encouraging the migrant to take part in shopping, travel, and recreational activities)
- Completing language learning content from an additional partner

COV are responsible for the in-game item store and means to generate currency by playing the game. Other partners will be responsible for awarding coins in response for use of their service in a fashion they deem worthy of reward, though COV will aid where relevant in mixed reality game design in Y3 (particularly the context awareness system). The currency itself will be held as an integer within the centralized user profile for the MASELTOV system. The partner maintaining this user profile system will therefore have responsibility for security and stability of the service.

The working system is presented in the technical prototype accompanying this deliverable allowing the player to earn and spend coins in game. User testing in Y3 will focus on whether they see any value to the currency, and whether it might influence their use of other services to get large 'payouts'. This is likely to be tied to how 'fun' they find the game; in the event they see no value to the currency research should explore as to why this is, and whether there is a clear psychological distinction between spending time on certain behaviours versus spending money in a serious F2P context. Depending on outcomes, the approach can be redesigned, removed, or built upon in Y3.

A positive finding would be very relevant to serious games in the emerging F2P marketplace as it would provide a concrete model for adapting behaviour, which is not overly dependent on the game design itself (rather, we use a fun game as an incentive for other behaviour). This would therefore be replicable across subject areas and behavioural challenges with broader impact in areas such as education, public health, and the environment.

We noted that development of games tends to be iterative and participatory. This is often informal in context if it is to be achieved with sufficient frequency and finite resources. This means a need to test and iterate internally and frequently, changing elements in response to both internal testing and user feedback. This in turn makes it challenging to produce an incremental series of prototypes, as responsiveness to this feedback requires the capacity to introduce and remove elements as required. Noting also the need to provide engaging gameplay, consideration of the entertainment marketplace is a worthwhile activity. The entertainment gaming industry tends to be represented by clearly defined genres, which have consistently shown success as a game design archetype and have thus been replicated. For a serious game designer, the challenge is marrying this entertainment genre with some pedagogical content, something which has led to designs ranging from having the player shoot balloons to solve mathematical problems, through to adding high scores to driving simulators (Winter et al., 2008). In MASELTOV, we seek to take this one step further through Research Question 2 by creating a platform game and coupling its 'business model' to the social objectives of the game and other MASELTOV services.

In the next Section, the translation of these research questions to prototype design is outlined. Drawing from Section 3, and in light of the research objectives, a design concept is defined built around themes shown by the literature as both relevant and effective in the context of cultural learning.

4.2 DESIGN CONCEPT

4.2.1 OVERVIEW

The overall design is built around four key themes: Empowerment, Abstraction, Experience, and Narrative. All of these hold particular relevance to the context of playful cultural learning, as identified in the various sub-sections below.

EMPOWERMENT

Empowerment has been shown to play a role in participation, for example increasing likelihood of engagement with democratic processes (Alathur, Ilavarasan, & Gupta, 2011), in turn linked to the inclusion objectives of the MASELTOV project. Technology such as the mobile internet is in itself a tool for empowerment (Alathur, et al., 2011), though understanding how to best use technology for a given context and situation remains a topic of research. One perspective argues that context, communication and identification are the key underpinnings of the successful use of mobile devices for empowerment (Leikas, Stromberg, Ikonen, Suomela, & Heinila, 2006). Games have rich potential for realising these concepts in novel forms. Context can be translated from real to virtual space, removing the consequences of failure or social difficulties; communication can be achieved and supported through gaming and online communities, or realised in synthetic forms with autonomous characters; and the use of avatars allows for a player to experiment with their identity.

This potential has been reflected in a number of studies seeking to utilise and understand the role a game might play in empowering an individual or community. An example of their use to empower hospital patients showed efficacy in a real-world context (Caldwell et al., 2013), supporting the view that games can empower the player through a range of mechanisms. Narrative is one means by which to achieve this (Mallon & Webb, 2005), as characterization and identification can be utilised as tools by which to transpose real-world problems arising from lack of empowerment, to ones which have identical traits, but are viewed from a different perspective. Consider, for example, the case of an immigrant seeking work - in a real-world context, they may feel disempowered, with little control over whether they achieve success. In a game, however, success may be granted when pedagogical objectives have been achieved, and the simplification of the process itself to focus on key learning objectives lends itself to a format in which the individual has greater control over the outcome.

Utilising narrative in games to achieve empowerment typically draws on a back-story which adds gravitas to an otherwise mundane situation. Returning to the example of the job-seeking task, what if the player must get the job in order to save the world (or a similar 'epic' objective)? The fundamental task may remain grounded in reality, and learning outcomes therefore remain transferable to real-world tasks; however, the motivation and sense of empowerment from which the player approaches the task can be profoundly adjusted. This approach is common to game narratives (Jimenez, 2012), reflected in entertainment as well as serious gaming genres. Given the benefits of empowerment for inclusion, and the issues tackled by the MASELTOV project, there is a sound basis on which to build on a narrative approach facilitating empowerment as a component of the game. This in part allows us to progress the research question outlined in the previous section regarding how best to realise playful cultural learning: we propose empowerment as a suggested component, and its validation would contribute to the understanding of how it might be achieved through narrative in this context.

ABSTRACTION

Given the task of developing a playful cultural learning environment, abstraction also appears to hold a high degree of relevance. It is possible to argue that all games incorporate abstraction to some extent (Fernandez-Vara, 2011), a necessary process when seeking to translate the complexity of a real or fictional world to a game-based interaction context. Yet serious games have the opportunity to consider this abstraction in pedagogical as well as pragmatic terms, exploring how solving abstract problems can translate to concrete learning outcomes. Literature identifies the need to "scaffold" learners in translating abstract learning outcomes to real-world problems (Annetta, Murray, Laird, Bohr, & Park, 2006), otherwise the risk exists that no learning transfer will be observable. Logically, the greater the degree of abstraction, the greater the risk - simulation-based approaches to training have long striven to minimise the level of abstraction between real and virtual worlds. Serious games, however, differ from simulations, in that they seek to educate through engagement and play, rather than by simply recreating a situation with as high a degree of fidelity as possible. This approach has been shown more effective than simulation in a range of contexts, including aircrew training (Mautone et al., 2010), suggesting deviating from reality to provide a more abstract, game based learning environment can have pedagogical as well as practical benefits.

In the case of MASELTOV, a need for a certain degree of fidelity exists, as we seek to provide a game from which individuals can transfer outcomes to real-world situations with scaffolding provided only by the game itself. However, as detailed in Section 5, the breadth of

other MASELTOV services have the potential to support and further scaffold learning. An example of this in practice would be the use of the in-game journal to prompt the player to consider a range of formal learning and practical resources, sourced from the Wiki or learning content provider(s), after completing a particular task, e.g. jobseeking, finding healthcare, or shopping.

For abstraction, a key component is how well we 'scaffold' the transition between in-game learning (see our report on Code of Everand² for more details and our qualitative and quantitative findings on this), and formation of learnt concepts and real-world behaviours. Games can be powerful tools to prompt reflection through abstraction, but require the learner make the link to the real world. User testing is therefore central in establishing how well users make this observation, and its subsequent impact. If early testing suggests the link is not clear, Y3 could add elements such as:

- Clear and direct messaging on cultural learning to make it 'top of mind' amongst players
- More direct links to supporting MASELTOV content and services
- Reworking and refinement of in-game narratives and dialogues to make cultural differences and consequences more apparent

Of course, simply observing the cultural theme of the game is of little relevance if it does not have subsequent impact. Behavioural change is not a straightforward (or necessarily ethical) goal to achieve, rather, we must message the user to enable them to make more informed decisions. In the case of an immigrant, this might be making them less anxious about social interaction as they are aware of how differences might occur and that behaviour that might appear offensive or dismissive is not necessarily intended as such. It might also prompt them to identify issues before facing them in the real world, allowing them to arrive at situations such as healthcare forewarned and hence forearmed with a knowledge specific to their host country's system achieved through contacting NGOs or using other MASELTOV services.

EXPERIENCE

Kolb's theory of learning through experience (Kolb & Fry, 1975) has seen much attention from game- and simulation-based learning communities (Liu, Jiao, & Liu, 2009; Naismith, Blanchard, Ranellucci, & Lajoie, 2009; Siang & Rao, 2004). It has clear parallels related to how games can allow players to explore problems, devise solutions, and observe the consequences of their actions. By allowing the player to experience situations in which cultural differences present themselves as difficulties, and guiding them towards solutions, a platform for experiential learning might be created. Some cautions arising from Kolb's theory are required, however: firstly, the notion of the "intuitive" learner put forward by Kolb and intrinsically related to the experiential cycle has consequences in terms of how we might assess and feed-back to learners. The intuitive learner, by this definition, takes an exploratory approach to learning, exploring worst as well as best cases: for example, when confronted by a dialogue choice, they may deliberately answer incorrectly or inappropriately to explore the outcome. This in turn means attempting to assess competence by the "correctness" of actions in game has limited value, and consequently seeking to feed-back to a learner their errors may be met with resistance or negation.

² <http://www.roadsafetyobservatory.com/Evidence/Details/10663>

Rather, the effective application of the experiential cycle in-game requires the development of branching or open-ended scenarios, that allow the intuitive learner to play-through and explore multiple outcomes and possibilities. Another trait of this form of learner is their tendency to return to scenarios multiple times to observe different outcomes, and games can support this through additional play-thoughts. Ensuring effective learning in this context requires, as noted for Abstraction, a suitable scaffold by which to support reflection and concept formation. In Section 4.4.3 we introduce the concept of the player's journal, in which the character controlled by the player makes notes on their own reflections and concept formations. The intent here is to harmonise the cultural learning of the in-game character, over which the player has control, with their own cultural learning.

As abstraction, empowerment, and experiential learning seem well-suited to MASELTOV for the reasons noted above, the game's design seeks to build on the literature and current understanding of how these work (and fail) in a game-based context. There is an exploratory aspect to the work undertaken here, reflective of the fact a generalized pedagogical approach remains elusive for serious games, due to the wide variations in usage context, target audience, and technical platform between projects.

Experiential learning is commonly used in serious games, as Kolb's cyclic model of experience > reflection > concept formation > application > experience is well suited to the rich and dynamic experiences games can allow. We have noted in previous work evolving Kolb's model towards a less linear 'Exploratory' cycle, that a rift can occur between virtual action and real world application, again related to the extent to which this transfer of concept formation is scaffolded and supported (see D7.1). In the exploratory and experiential case, feedback plays a central role within this scaffold. By relating feedback to real-world events and situations, we can start to bridge the gap between, for example, high scores in game and the development of real-world competencies. However, feedback is also a central component of effective game design - consider, for example, the omnipresence of scores, rewards, upgrades, and experience points across many genres of entertainment gaming. These serve to provide feedback at both micro (single action - e.g. in *Call of Duty* shooting someone gives experience points), and macro (again in *Call of Duty*, these points can later be spent on character upgrades allowing for strategic choices by the player).

If we are to translate to serious games, we need to achieve balance between a feedback model which supports sufficient frequency and depth to create an engaging game, but also has adequate pedagogical value to direct learners towards positive serious outcomes. Extremes on either end of this scale are undesirable - simply adding points for meaningless actions is unlikely to yield a change in behaviour. Similarly, at the other extreme, an overly 'gamified' approach can result in something which people enjoy, but fails to achieve its pedagogical goal - for example, with early games of MathBlaster, children quickly learnt that shooting balloons quickly was a better way to score than carefully selecting the right ones with the numbers to the puzzle (Wong et al., 2007). Exergaming also suffers from a similar problem, where the user learns to beat the game by minimizing their physical activity to beat the game, rather than performing actions as rigorously as possible. There is evidencing gaming elicits a certain 'win at all costs' mentality in a significant proportion of players, and these players will bypass or circumvent serious objectives if the feedback system allows it (Raybourn & Bos, 2005).

That said, there is a danger in trying to cater in pedagogical and entertainment terms to all audiences. Despite evidence suggesting the majority of the European population play games,

a significant proportion do not (ISFE 2012 - a consequence of both choice and availability). Much as it would be folly to attempt to make any social intervention appeal to everyone, so serious games have a predisposition to reach a certain demographic, and attempting to broaden this appeal excessively can result in compromises that alienate the core audience, for example pushing educational content to the forefront, or trivializing the game's challenge level. Again user testing must play a central role in establishing how well a game reaches various audiences, and the developer must remain flexible and adaptive to user feedback, something we're keen to do in MASELTOV. One notion of feedback described in is that of 'flow'; a description of an optimal mental state for learning achieved by careful balance of task difficulty with learner ability. This relates well to games which often engage users well through an adaptive and user-centric approach to this balance. It is for this reason we intend to support multiple difficulty levels within the game, allowing the user (though the 'jobseeking' theme) control over the challenge and reward level.

Finally, it is worth giving some note to the coin reward, equipment system, and free-to-play model and their pedagogical underpinning. This is at the exploratory edge of game pedagogy, as whilst systems to reward behaviour have certainly been deployed in many forms (for example in the Environment area to minimize energy consumption), still little empirical evidence informing their design exists. It would appear that there are several reasons these might work as incentives:

- They are reflective of social capital; i.e., someone with a large amount of currency is viewed to have earned it through sustained engagement within a community, or be performing positive actions within it. For this to work, the community needs to be of sufficient critical mass that the social value is relevant to the individual - having a million credits in a system without any other users is unlikely to give the owner a sense of social status.
- They allow access to desirable content; for example free-to-play entertainment games often offer 'premium' content for those willing to pay, allowing them to get higher scores (e.g. Bejeweled), or access new content (Angry Birds).

Ultimately what matters is that the currency must have (perceived) **value**. This is not simple to achieve and requires either content which is considered fun and engaging (or educational) enough to warrant time or financial investment, or a social critical mass that can create social value for currency (either competitively, e.g. leaderboards, or collaboratively). We seek to explore this in MASELTOV through the research question identified in the previous section; ideally through players sourced from deployment on Google Play, though with qualitative work in the user tests in Y3 also informing the design and providing an early indicator if this objective is achievable, and if not, what lessons might be learned.

NARRATIVE

As described, empowerment is a common and demonstrably effective approach used in games seeking to influence behaviour (Caldwell, et al., 2013). It appears particularly suited to the case of a game for immigrants, as cultural exclusion can be seen to be linked to disempowerment: excluded immigrants feel they have no role in influencing their host country's attitudes, policies, and systems. Following the theme of empowerment, we adopt an approach taken by other serious games, which combines a partially-abstracted narrative together with an overarching story seeking to both reflect common challenges faced by immigrants, whilst presenting this from a position of empowerment.

Hence, the player is cast as the role of a scientist in an "experiment gone wrong" scenario. The introductory cutscene of the game (viewable in the current prototype) describes events prior to gameplay: The player was at the centre of an experiment which, unintentionally, split reality into two diverse cultures, and was consequently the only individual empowered with the ability to traverse these two "dimensions" of reality and interact with both cultures. Reflecting Ghandi's remark that "no culture can survive if it attempts to be exclusive", these diverse cultures are struggling to survive and the player is tasked with recreating the experiment to reconcile the cultures. This is no straightforward task: to do so, the player requires key components only available in the capital city. Gameplay starts with his/her arrival at the airport terminal, and gameplay is introduced through a travel scenario that requires basic differences in cultures during travel be observed. For example, an information desk clerk at the airport behaves differently in the more formal dimension when compared to the less formal one. As they arrive, the player's journal automatically updates with their observations of how cultural interactions differ, reinforcing learning outcomes. They transition from the airport to the train station, interact with a ticket machine, and travel to the centre of the city.

The open square in the centre of the city allows the player a degree of freedom in their next course of action. They need to fulfil basic needs: shopping, accomodation, healthcare, and finding a job, in order to generate the income they need to collect the key components to rebuild the experiment. Accomodation requires they understand the differences in culture when seeking to find a place to stay; in finding healthcare they observe how cultures differ in their approach to finding care and communicating with doctors. Jobseeking - identified as one of the principal areas for game-based learning - consists of four "interviews", each duplicated between the two cultures. Differences in process and practice emerge, for example formal approaches to application requiring transferable skills be identified and documented, versus an informal networking-based approach to securing employment. Again, the player's journal automatically updates with their notes reinforcing the learning objectives and outcomes.

Given this freedom, the player can approach these jobs in any sequence, each being accompanied by a short, entertaining, platform level. The goal of these levels is to provide relief from the narrative-heavy aspects of the game, mandated by the need to transfer cultural understanding through interactions. The narrative is also intended to be expansible, with additional "jobs" able to be added over time. Between work, the player is able to visit the shopping area and purchase upgrades for their character using currency earned, creating a basic economy. On completing all four jobs, it is envisaged a potential end-point to the game could be inserted through the player recreating their experiment and reconciling the two dimensions. However, the design could also be expanded with additional jobs and items available for purchase.

Healthcare scenarios will also be implemented in the M30 deliverable. After completing two of the four jobs, the player will develop an illness and need to seek healthcare. In doing so, they again need to transition between dimensions to puzzle-solve, and observe the differences in the healthcare system, reinforced through journal updates.

4.2.2 MECHANICS

At any point in the game, the player is able to 'flip dimensions'. This changes the cultural backdrop of the game between 'high' and 'low' cultures as defined by Hofsteade. Each task in

the hub will be created with avatar interactions in the two cultural forms. The player will therefore experience the four tasks of travel, healthcare, shopping, and jobseeking in high and low cultures. These will be fictitious cultures informed by Hofstede's scales: we are not providing a simulation, rather, we are allowing the player to develop a high level understanding of how cultures can differ and the impact this might have on various common tasks. It would be hoped - and should be assessed through user study - that this makes them more aware of, and ready to engage with, cultural learning materials specific to their context. There may also be an indirect impact for the wider non-immigrant audience in raising their general level of cultural awareness through playing the game, though this is not a primary objective as it is beyond the scope of MASELTOV.

The game also exploits the dimension flip in the platform levels to provide puzzles: e.g. platforms or coins that only exist in one dimension, or barriers that can be bypassed. Following early stage user testing these levels emphasize exploration; rather than falling to their death, the player simply drops to the floor and be able to climb back up and keep exploring. The purpose of the use of the dimension flip in an entertainment context is to familiarize the user with the dimension switch outside of a pedagogical context.

4.3 PEDAGOGICAL DESIGN

With the overall design identified in Section 4.2, this section considers in more detail the pedagogical underpinnings of the overall game design. In particular, this relates to cultural learning: how can we create a basis for how cultures might differ within the narrative and two dimensions, and use this to create experiences which allow for learning transfer?

4.3.1 CULTURAL LEARNING

In an effort to demonstrate the disparity of the cultural definitions, Hofstede provided a narrow view that is commonly perceived in Western countries: "civilisation or refinement of the mind and in particular the results of the refinement including education, art, and literature". Biggs and Moore define culture as the 'the sum of total ways of living built up by a group of human beings which is transmitted from one generation to another. Wild and Henderson and Hofstede added the element of adaptation in the definition of culture in a sense that culture is a demonstration of ways in which an identifiable group adapts to its changing environment. In this view people may belong to more than one cultural group and therefore, possess a subset of a culture's total identifiable characteristics. Finally, individuals may not remain totally committed to their birth culture and exhibit aspects of other cultures.

Culture should be distinguished from human nature (Hofstede & Hofstede 2006). Human nature encompasses the common characteristics of all human beings, like the ability to feel fear, the need to associate with others, and the facility to observe the environment and to communicate it with other humans. However, what one does with these feelings and how one expresses them is modified by culture. The individual's personality includes the individual's unique personal set of patterns of thinking, feeling and acting that need not to be shared with other individuals (Hofstede & Hofstede 2006). Individual personality patterns are partly inherited within the individual's unique set of genes and partly modified by the influence of culture as well as by unique social experiences (Wild and Henderson, 1997).

Collis (1999) defined several cultural levels that should be taken into account when implementing learning environments: societal, personal, organisational, and disciplinary. These cultural levels as argued by Seufert (2002) influence the acceptance, use and impact of

online learning environments. Moreover it appears to be a general consensus that ‘culture has a definite and very strong influence on the design and use of information, communication and learning systems, as well as on their management, despite the lack of identifiable research in these areas’ Wild and Henderson (1997). Several educational researchers (Gutierrez and Rogoff, 2003) highlighted the influence of culture on different learning styles. The cultural learning styles approach arose from an attempt to achieve a transition from surface approaches (e.g. rote learning) to deep approaches (e.g. constructive learning through learning communities). Although surface approaches to learning are still prevalent (Trigwell and Shale 2004), the cultural style approach offers a way to characterize cultural groups without suggesting hierarchies in cultural practices (Gutierrez and Rogoff 2003).

It is apparent therefore that socio-cultural insights in conjunction to understanding how individuals learn may assist game and educational designers to develop more culturally sensitive games by balancing play with pedagogically-driven cultural learning processes. However, caution should be placed on over-generalising such balance as different combinations between pedagogical approaches and game mechanics may have certain implications when establishing learning activities aimed at culturally diverse groups of individuals. This impact will ultimately result of either success or failure of the group dynamics and therefore of the learning activity itself (Katakalos et al., 2005).

There have been several cultural studies that have each developed their own cultural classification system, their own framework. One of the most popular is the Value Survey Module (VSM) created by Hofstede. The original study included over 100,000 responses and this has been the most quoted and used survey of its type. This study originally identified four indices by which a culture could be measured (see Figure xxx):

- Power Distance Index (PDI): Is the extent to which the less powerful members of the society accept and expect the power is distributed unequally. Cultures that support low power distance are more democratic
- Individualism vs. Collectivism Index (IDV): The degree to which individuals are developing a sense of belonging into groups. In individualistic societies the focus is on individual rights and personal achievements. In collectivist societies, individuals acts as being members of a larger community viewed as an extended family where there is unquestionable loyalty.
- Masculinity vs. Femininity Index (MAS): Masculine values are materialism, competitiveness, assertiveness ambition and power, whereas feminine cultures place more values on relationships and quality of life. In masculine cultures the differences between gender roles are less fluid than in feminine cultures where men and women have the same values underpinned by modesty and caring.
- Uncertainty Avoidance Index (UAI). It describes the extent to which members of the society attempt to cope stressful situations by minimizing uncertainty. People in cultures with high-uncertainty avoidance try to reduce the occurrence of unknown and unusual circumstances and to proceed with careful step-by-step planning and by implementing rules and regulations. In contrast low uncertainty avoidance feel comfortable with unstructured situations and changeable experiences and try to have as few rules as possible.

Individualistic / Collectivist	Degree to which a society reinforces individual or collective achievement and interpersonal relationships.	Individualism: Focus on individual needs. Looking after themselves and immediate family	Collectivism: Focus on collaboration: protection of members in exchange for unquestioning loyalty
Masculine / feminine	Degree to which a society reinforces or does not reinforce the traditional masculine force model	High-M: Men's values very assertive and competitive; qualitatively different from women's values	High-F: men's values modest and caring similar to women's values
Uncertainty avoidance	Level of tolerance for uncertainty and ambiguity within the society	High: Acceptance of familiar risks; fear of ambiguous situations and of unfamiliar risks	Low: Comfortable with ambiguous situations and unfamiliar risks
Power Distance	The degree of quality or inequality between people in a country's society	Low: inequalities between people are minimized; all members of the society treat each other as equals; all have equal rights; there are fewer supervisory personnel	High: inequalities between people are expected and desired; respect is basic and lifelong virtue; subordinates expect to be told what to do; the powerful have privileges

Figure 1: Hofstede's dimensions of cultures (source: Hofstede & Hofstede, 2006)

In the context of addressing cross-cultural communication in the Masseltov game, we adopted Hofstede's Cultural Dimensions framework (Figure xxx) to discern values that are translated into practices on the basis of different case scenarios. We perceive that by including variations of different cultural instances instantiated through particular MASELTOV game mechanics dynamics, and in-game dialogues would create a playful, persuasive, engaging and memorable cultural learning experience for the players that would help them to achieve behavioural change.

We have also attempted to align these cultural dimensions to goals or intended learning outcomes that are achieved while playing with the game. For example, in the first dimension, by selecting the dialogues that tend to reflect individualistic values, the player learns the characteristics of an individualistic society and how these may or may not help the player to unlock certain game features for proceeding to the next dialogue/scene or level. Similarly, in the second dimension engaging with dialogues that highlight collectivist values, the player learns about varying ways of acting collaboratively to extract valuable information leading to the next cultural challenge.

4.3.2 TARGET LEARNING OUTCOMES

Discussion with NGOs identified a range of key misconceptions and issues immigrants face in several topic areas. This was supported by work in the initial phases of the MASELTOV project, which put forward travel, healthcare, jobseeking, and shopping as areas in which cultural differences can manifest themselves.

It is important with a game-based learning intervention to be realistic in terms of anticipated contact time and impact. It is equally important to select targeted learning outcomes which are realistically required by learners, rather than simply easy to achieve. Initial discussions with NGOs reinforced this: for travel scenarios, purchasing a ticket may be a challenging process on arrival in a new country, but the skill is quickly learnt. More valuable is the ability to make social contacts, recognise problematic situations in advance, and respond appropriately.

Hence, the learning objectives for the game are outlined as follows:

Travel

LO1. Understand how the process of asking for information can vary between cultures. Information itself will be culture and location specific; the goal here is to communicate how the process of information seeking may vary. Referring to Hofstede's framework, one example here would be the use of impersonal tools (e.g. message boards), versus face-to-face social interactions. Through playing the game, the player should recognise that when faced with a different culture, different routes may be required to gain information as efficiently as possible.

LO2. Understand that

Healthcare

LO3. Understand how the process of accessing healthcare can vary between cultures. For example, some cultures utilise a single point of contact (e.g. a General Practitioner), who then refers them to an appropriate specialist, whilst some rely on the individual to identify the most appropriate source of care for their condition. In game, the healthcare scenario will demonstrate different access routes between the two dimensions.

LO4. Understand how information related to health can be treated differently between cultures. In particular doctor-patient confidentiality, and centralisation of information sources as well as patient access. Again, the game will include different dialogues with healthcare providers between dimensions, reinforcing this concept.

LO5. Understand how patient rights can vary between cultures. Access to translation services, the right to obtain a second opinion, and the need for open dialogue with a doctor can vary. Dialogues in-game will again reflect how these may have implications on how effective healthcare can be secured in different cultures.

Jobseeking

LO6. Understand how the process of finding employment can vary between cultures. NGO discussions highlighted in particular the case of 'networking' versus formal application: cultures with a more formal approach often require candidates be able to identify and document transferrable skills, whilst cultures which use association and

networking more predominantly require a softer skill set. Hence, the game will include two different processes for finding employment in the two dimensions.

- LO7. Understand how job interviews can vary between cultures.** A central theme in the employment process is how to succeed at interview; again the ability to recognise transferrable skills, and present competencies in their best possible light alongside an understanding of how both breadth and depth of experience may be presented is advantageous. Four "job interviews" in the game, each duplicated in two different cultures, will provide a basis for addressing this target learning outcome.

Shopping

- LO8.** Discussion here with NGOs highlighted some misperceptions of immigrant's issues: certainly whilst processes such as haggling and bartering for goods vary between cultures, with respect to the host countries targeted by MASELTOV, developing these skills would have limited value. However, a broader learning outcome was identified; the ability to socialise and engage in conversations whilst performing tasks such as shopping is a valuable one. Defining this in concrete and addressable terms is difficult, however; an overall conclusion is that social elements of shopping and their cultural differences would be a long-term goal for inclusion within the game.

Note the commonality between LO1-7; that the learning outcome is intended to be an understanding of how processes can vary between cultures, rather than learning how to act in a specific culture. This is a necessary scoping exercise, as developing rich narratives for each host and source culture (3x20+, if all Arabic speaking nations are included, and even then on the assumption each country has a clearly defined and unambiguous "native" culture) would not be pragmatic within the MASELTOV project. Rather, the game seeks to raise this awareness then leverage the wider resources and contact points provided by the MASELTOV platform to allow interested learners to transition to more formal learning resources specific to their culture as well as that of their host country.

4.4 INTERACTION DESIGN

A mobile platform presents a number of challenges in creating a playable game. The touch-screen interface common to devices, coupled with a limited physical screen size, requires icons be carefully designed to allow intuitive touch-based interaction. Similarly, player control of the character needs to be implemented in a way which allows the player to navigate the game world without becoming frustrated or challenged by the UI, rather than the game.

Whilst the game itself is 3D, a 2D interaction paradigm was adopted to simplify navigation of the environment, reflecting that the target audience may not be 'hardcore' gamers. The player has lateral control of the character (move left/right), can jump, and flip between the two cultural dimensions. Furthermore, they need to be able to access the journal, game settings, links to other MASELTOV services, and their inventory.

4.4.1 CORE CONTROLS

A range of prototype control methods were implemented and tested to ascertain the most usable control option for the game. This included:

- Visual 'buttons' for left, right, jump, and dimension flip;
- Accelerometer-based lateral movement (tilt laterally to move), with buttons for jump and dimension flip;
- Accelerometer-based vertical movement (tilt vertically to jump), with buttons for left, right, and dimension flip;
- Accelerometer-based dimension flip (shake the device to flip dimensions), with buttons for left, right, and jump;
- Full-screen control, allowing the player to touch anywhere to the left or right of the player character to move in that direction, with buttons for dimension flip and jump.

Of the five, testing showed the first to be the most usable (reflected in end-user testing results from work by CURE at NGOs, as well as internal testing). Testing also highlighted the challenge in creating a viable interface for non-gamers, with many reporting difficulty and unresponsiveness in the controls on the smaller screen. Responding to this, button size was increased to create larger tactile interaction areas. The first control setup has been integrated into the game as the default configuration, with additional setups accessible through the settings menu.

Context-sensitive interaction prompts also appear within the game when the player nears an NPC (allowing them to initiate a dialogue), and interactive object (for example the ticket machine and job centre board), or a scene exit (allowing them to transition to a new game area). User testing also proved valuable here, with font size being increased to improve readability on devices with smaller screens, as well as contrast (see Section 4.6 for illustrations). The following Figure illustrates the developed buttons created for the game in-line with the overall aesthetic design:



Figure 2: Interactive buttons developed for the game

The following sub-sections 4.4.2-5 describe the functionality of the individual menus and tools in further detail.

4.4.2 SETTINGS MENU

The settings menu is designed to allow the player to perform a range of tasks related to the overall gameplay experience. This includes simple functions such as allowing the player to start a new game, enable and disable audio, select a control setup, and exit the app.

4.4.3 JOURNAL

Both in terms of gameplay and pedagogical design, the journal serves several critical functions. Firstly, it contains a visual in-game help aid, describing how to navigate the game world. This replaced an earlier tutorial at the start of a new game, which again user testing indicated was proving difficult for non-gamers to understand and play through. Particularly from a serious gaming perspective, as the tutorial did not deliver pedagogical content, its omission allows for the player to get into the game more rapidly and start experiencing cultural learning content.

More significantly, the journal tracks both player objectives, and progressively updates written by the player character to reinforce learning outcomes, cued by a flashing icon. This serves to guide the player through the game, whilst reinforcing learning outcomes in the form of observations made by the player character of how NPCs differ between dimensions.

4.4.4 MASELTOV LINKS

Links to other services are a planned integration in M30, as the simultaneous nature of development limits the ability to form links at early prototype stages. The game currently has the capacity to immediately launch another mApp, or web-browser page, allowing other services to be rapidly linked in or redirected to. The intent is also to liaise with the partner providing language learning material and more formal learning resources to annotate journal updates with links to educational material relevant to the topic. For more detail of the planned integration path, please refer to Section 5.

4.4.5 INVENTORY

Inventory management is particularly challenging on mobile devices, as multiple screens can be difficult to both read and navigate if font and button sizes are too small. Increasing these sizes reduces the amount of screen space available for content, and therefore the inventory contains brief information on the various purchasable and collectible items within the game.

This is particularly necessary since, referring back to Section 4.1.1, a key research question is whether virtual currency can be used to incentivise positive behaviours and integration amongst immigrants. For such incentivisation to work, this currency requires a perceived value. Whilst social comparators may work to stimulate this value for a proportion of the player base (e.g. competing with another player for the most coins), purchasable rewards - i.e. something to spend this currency on - is equally important.

Hence, the inventory is designed to contain a range of functional and cosmetic items which can be "equipped" by the player. These are in turn purchasable in the shopping area of the main game hub. There is no limit to the number of items a player can own, though, for obvious reasons, they are only able to equip a single item per inventory "slot", e.g. a single

hat. Partly this provides a pedagogical base from which to consider some high level themes, such as what clothing is appropriate for a job interview; more fundamentally, it allows a sense of character progression and development, as well as a means to spend earned currency.

4.5 VISUAL DESIGN

As noted in Section 4.3, visual aesthetic is an important component when seeking to attract and retain players in an online free-to-play context. To this end, a significant volume of 3D content has been developed to provide a backdrop in which to ground the serious game.

The visual design of the game seeks to both stimulate engagement, and provide a backdrop against which to relate learning content to real-world contexts. Therefore, the design seeks to create common areas and tasks in which cultural differences can emerge, ranging from travel and transport areas, though to more social areas such as a hotel lobby, and jobseeking content including a job centre. An animated introductory 'cutscene' has also been developed. This serves to introduce the overall narrative of the game, and aims to engage the player with the story as the game begins. On a technical level, content has been designed to be low-polygon in support of the mobile platform. For a full list of compatible devices, please refer to Appendix I.

Coupled with real time rendering, this is a significant technical undertaking, which has represented the majority of work effort in T7.4. Given the usage context, though, of a "gamer" immigrant engaging with the game then transitioning to more formal learning through the MASELTOV platform once the game has highlighted relevant areas in which cultural misunderstandings occur, the visual aesthetic is an important success factor. This is particularly the case with Google Play, which is saturated with free-to-play games, and to reach audiences who are not engaging with cultural learning materials, intrinsic appeal as a fun game is desirable.

Alongside the 3D content, a number of advanced mobile rendering techniques have been applied to create an immersive environment. Lightmapping, allowing for high-performance real time shadows and shading is applied to environments, coupled with dynamic lights that illuminate the scene. Animation blending is applied to the main character, allowing them to smoothly transition between animation states. Textures are compressed to ETC-1 format for optimisation on the mobile Android platform. Shaders are used to enhance the visual quality of the game, allowing for surface transparencies, diffusion, and bump mapping. A PC build of the game has also been developed for testing purposes which supports real-time shadows, post-processing effects, and keyboard and mouse interaction.

The current size of the game (~100mb) surpasses the 50mb Android Marketplace file size limit, however, the use of asset bundles and streaming of resources allows this to be overcome in relatively straightforward fashion. The integration with the mApp, covered in more detail in Section 5, allows the game to be launched from the MASELTOV dashboard provided it has been pre-installed.

The following pages illustrate examples of content created for the game.



Figure 3: The train platform, used for interactions with passers by and the process of catching a train.

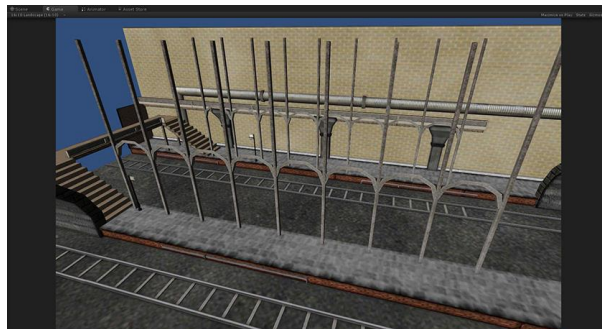


Figure 4: Alternate train platform at the arrival destination, used in the travel scenario.



Figure 5: Train station exterior.



Figure 6: Ticketing office inside the train station.



Figure 7: Airport arrivals.

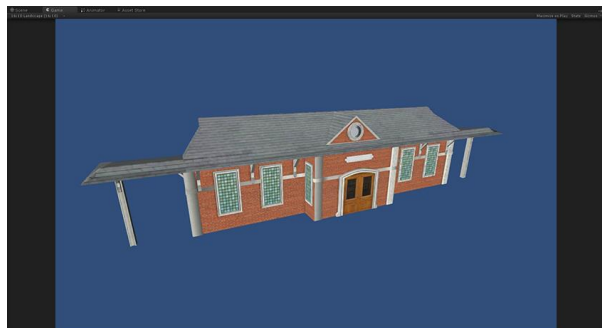


Figure 8: Alternate train station exterior at the arrival destination.



Figure 9: The train used for travel between destinations, in the context of the travel learning scenarios.

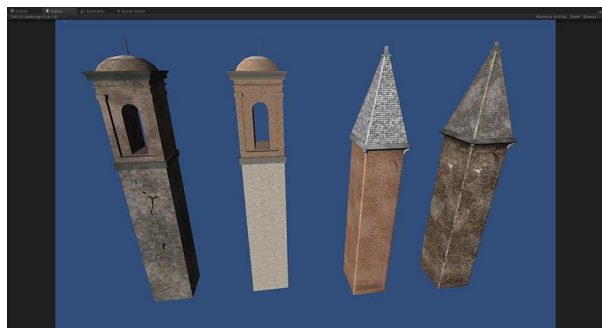


Figure 10: Backdrop artwork designed to create immersive spaces.

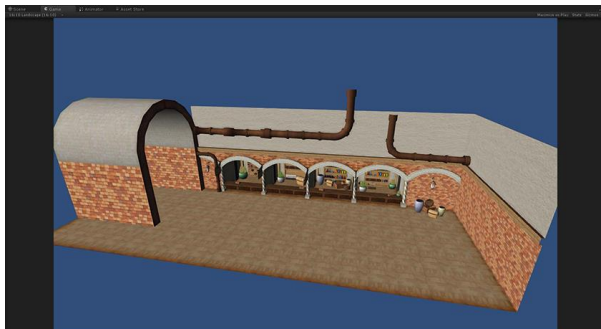


Figure 11: Shopping area. By interacting with characters, the player can purchase upgrades.



Figure 12: Shopping area (II). Cultural differences can be observed when shopping between dimensions.

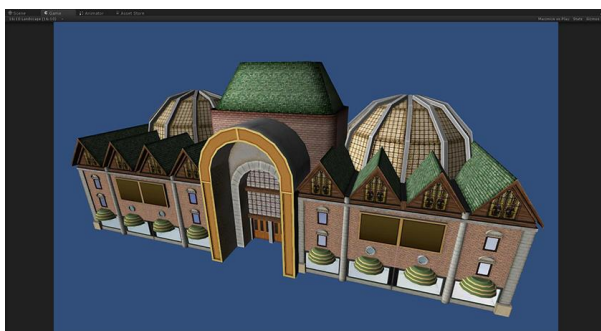


Figure 13: Hospital. Here the player observes cultural differences in healthcare.

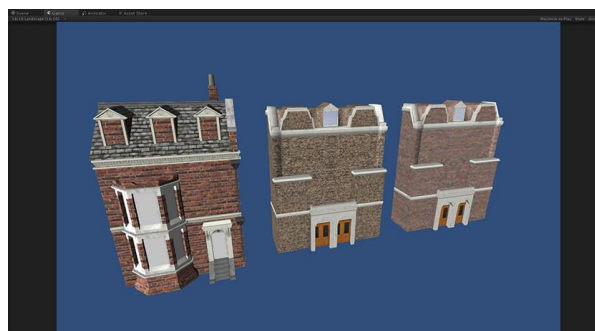


Figure 14: Backdrop artwork seeks to provide a plausible and immersive environment

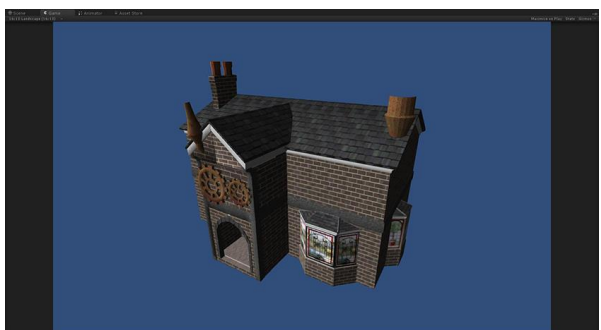


Figure 15: Additional background artwork (I)

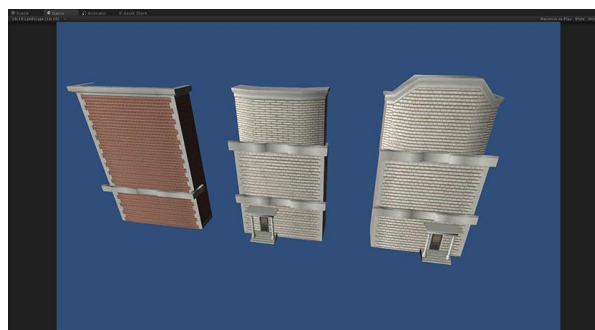


Figure 16: Additional background artwork (II)

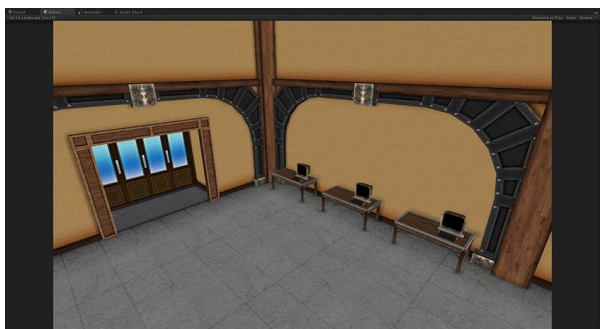


Figure 17: Job centre interior. Used in the jobseeking scenarios.



Figure 18: Job centre interior (II)

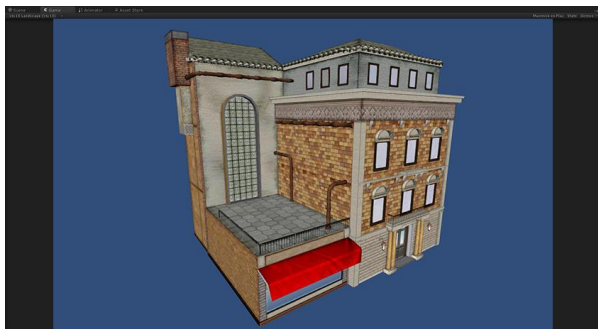


Figure 19: Additional building used in the shopping area.



Figure 20: The player's accommodation



Figure 21: Hotel interior. By moving between dimensions, the player learns cultural differences in socializing and hospitality.



Figure 22: Hotel interior (II)



Figure 23: Hotel interior (III)

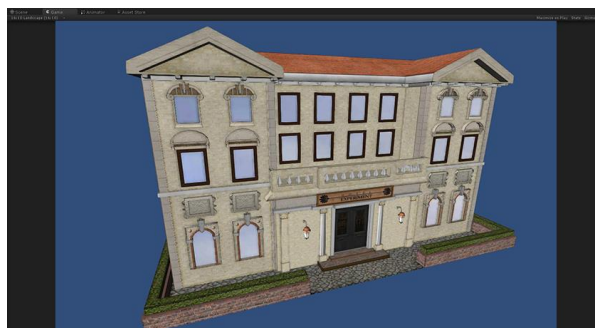


Figure 24: Hotel exterior

The next section illustrates how these environments have been used to create a backdrop for playful cultural learning within the serious game. They are modular in nature, allowing for new environments to be built and populated rapidly. Therefore, work in Y3 will seek to capitalise upon this to expand the game and introduce additional scenarios.

4.6 SUMMARY AND IN-GAME SCREENSHOTS

This section has presented the rationale for the serious game design within MASELTOV, in the form of research questions which represent both current challenges in serious game design, and opportunities to explore and address them. Identifying the themes of Empowerment, Abstraction, Experience, and Narrative, the design seeks to realise them in a mobile gaming context: The player is empowered with the role of an individual with the unique power to traverse dimensions of reality; in doing so they experience abstractions of real-world cultures informed by Hofstede's model; and an overarching narrative seeks to engage and compel them to learn the differences between the cultures to succeed in the game. Creating the backdrop to deliver this in an engaging fashion has required substantial time investment in the development of visual assets as shown in the previous section; completion of this work has created a platform in which to rapidly develop and expand on the game towards the future D7.4.2. User testing of iterative prototypes with CURE, documented in the relevant usability testing deliverables, has provided useful insight into which directions to progress this development in Y3 of MASELTOV.

The following pages shown screenshots of the content from the previous section visualised in the game engine. The engine itself required a significant codebase be developed to underpin features such as character and menu navigation, inventory management, the journal system, and the dialogues, which again seeks to support rapid content development in Y3. The APK delivered alongside this deliverable allows the user to experience these features alongside the overall narrative of the game.



Figure 25: Real-time and lightmapped illumination are applied. This allows for the environments in the previous section to be lit, creating more immersive spaces. Subtle differences in lighting between cultural "dimensions" are used to cue the player as to which dimension they are currently in.



Figure 26: NPCs, such as the hotel receptionist shown here, allow the player to initiate dialogues. The content of this dialogue varies depending on the dimension the player is currently in, demonstrating cultural differences.



Figure 27: The train station, shown here, forms part of the travelling scenario. Icons on the left allow the player to open their journal to see their notes on how cultures differ, reinforcing learning outcomes.



Figure 28: At the job centre, the player can choose from a jobs board and subsequently must face interviews. Depending on the dimension they are in, both the jobseeking process and interviews themselves vary.

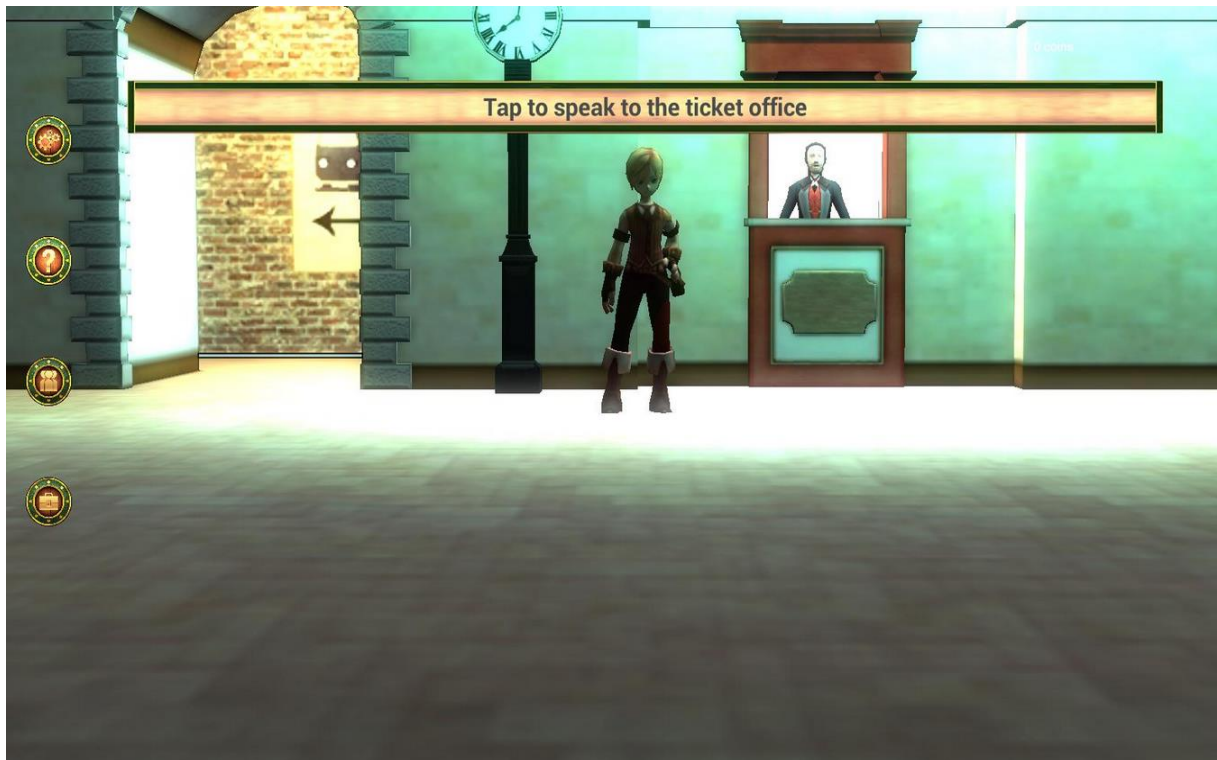


Figure 29: At the ticket office, the player must negotiate some simple differences in how travel varies between cultures: for example, ticket purchasing and validation.



Figure 30: User feedback has provided some useful insights into interaction design: in this more recent version than Figure 27, the touch interface has incorporated an enlarged font and restyled GUI elements.

5 INTEGRATION WITH MASELTOV SERVICES

One of the uniquely appealing aspects of playful cultural learning is its potential to reach audiences who may not respond to more formal learning material. Therefore, the game has potential to serve as a route into MASELTOV services for this demographic. However, it is equally true that immigrants wanting specific information on a situation such as a job interview may not wish to have to "play-through" a game to access this information. Hence, the role of integration of playful cultural learning with other MASELTOV services is to make available and incentivise the use of these other services, providing a potential route-in to the platform.

The currency system and accompanying research question in Section 4 have been developed to allow an integration pathway which is technically lightweight, reflecting the prototypical nature of MASELTOV services and the difficulty in integrating multiple services in simultaneous development, but also pedagogically rich. The notion of "gamification" of services is increasingly recognised: awarding coins provides a means to gamify other services, with coins used both as a status indicator in the user profile, and as a means to purchase upgrades for the players' character such as clothing within the game itself.

Due to the extensive use of multimedia content within the game, such as the 3D models illustrated in the previous section, the APK file size of the game is larger than other services. Fully integrating it into the mApp as a single download would consequently result in a reduction in availability of other services; furthermore, app users may tend to view the mobile device itself as the "swiss army knife" of the information age, rather than expecting to download an app with a wide range of services and content. The game is thus intended to be deployed in a standalone fashion, but with clear links within the game to additional tools and resources. The integration specification for the game is included in D3.1.2; effectively the game stores the coin total for a player in the user profiling system, and this is in turn used by other services to incentivise and reward use, as well as by the game to suggest the player could earn additional coins by using MASELTOV services.

Examples of this could including using the AR Navigation system to initiate a challenge to visit a nearby point of interest. On completing the challenge, the coin total stored within the user profile updates. On loading or reloading the game, the game recognises the change in value from the previously stored data, and congratulates the player for completing a challenge outside of the game. Similarly, the Text Lens may create a challenge to scan a certain word or phrase, and also provide a currency reward to the player; adding validated content to the Wiki, posting on forums, or participating in research-related activities such as surveys may also be incentivised. The lightweight technical nature of this form of integration allows these ideas to be explored and evaluated in Y3, supporting research towards the question posed by Section 4.1.2.

6 SUMMARY AND CONCLUSIONS

In this deliverable, two key research questions have been identified, drawing from the background literature in Section 3: How can we provide and evidence playful cultural learning in a serious game, and can virtual currency be used as social capital in a free-to-play game? These questions have been used to drive the design and development process of the serious game for MASELTOV. The overarching theme of playful cultural learning has been scoped and defined with respect to the target audience of immigrants with mobile devices, seeking to download an engaging and playable gaming experience through Google Play. The key themes of empowerment, abstraction, experience, and narrative have been expanded upon to generate a game design which seeks to provide a novel and innovative approach to playful cultural learning, recognising the challenges of gaining uptake in a demanding marketplace and seeking to reach demographics who may not engage with the formal learning content provided by other MASELTOV services.

The focus of work towards the final iteration of this deliverable, D7.4.2, will be to work within the environments created and documented in Section 4 to build a robust and informed narrative and dialogues, referencing the cultural framework of Hofstede (Hofstede, 2005), with input from partners with expertise in e-learning as well as first-hand experience working with immigrants to address and refine the target learning outcomes specified in Section 4.3.2. More detail on the narrative and dialogue authoring process can be found in D7.3, and the technologies and pedagogical concept developed within this deliverable will feed-in to the development of the game, in-line with the convergence of tasks 7.3 and 7.4 to provide a serious game which uses avatars and characters as a basis for playful cultural learning. Y3 will also emphasize integration aspects, following the scheme set out in Section 5. Here the use of virtual currency is key, serving to gamify the use of other tools, incentivising players of the game to use other MASELTOV services and engage in mixed-reality gaming using tools such as AR Navigation and the Text Lens.

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APPENDIX I - LIST OF SUPPORTED DEVICES

The following mobile devices have an ARMv7 or greater processor, required to provide 3D content at the level of fidelity within the MASELTOV game with interactive framerates. Technology availability limits the ability to test the game directly on these devices, however, the Unity platform has been tested on the devices in the below list. Newly released devices have near-ubiquitous support for ARMv7 and will be capable of running the game. The game has also been tested on a Sony S1 tablet; tablet devices in general have higher hardware specifications and are likely to support the game, though directly supporting tablets is beyond the scope of the project:

Acer Iconia Smart	Samsung Infuse 4G
Acer Iconia Tab A500	Samsung T-Mobile Sidekick 4G
Advent Vega (P10AN01)	Sharp Galapagos 003SH, 005SH
Dell Streak, Streak 7	Sony Ericsson Xperia Arc
HTC Desire	Sony Ericsson Xperia Play
HTC Desire Z (T-Mobile G2)	Toshiba AC100 smartbook
HTC Desire HD	Toshiba AS100 tablet
HTC Droid Incredible/HTC Droid Incredible 2	Viewsonic gTablet
HTC EVO 4G, EVO Shift 4G	Acer Liquid E
HTC Flyer	Acer Liquid (Liquid A1)
HTC Glacier (T-Mobile myTouch 4G)	Archos 101 Internet Tablet
HTC Incredible S	Motorola Charm
HTC Inspire 4G	Motorola Droid (Milestone)
HTC Nexus One	Motorola Milestone XT720
HTC Thunderbolt 4G	Samsung Galaxy S 4G
Huawei Ideos S7	Samsung Nexus S
LG Optimus 2X	Sony Ericsson Xperia X10
LG Optimus Black (P970)	
LG Optimus Z	
Motorola Atrix 4G	
Motorola Bravo	
Motorola Cliq 2	
Motorola Defy	
Motorola Droid 2, Droid 2 Global	
Motorola Droid Pro (Motorola PRO)	
Motorola Droid X	
Motorola Xoom	
POV Mobii Tegra Tablet	
Samsung Continuum (i400)	
Samsung Droid Charge	
Samsung Galaxy S (i9000, Captivate, Fascinate, Vibrant, Epic 4G)	
Samsung Galaxy S II	
Samsung Galaxy Tab, Galaxy Tab 10.1	