To Boldly Go...

Designing an agent-based intercultural training tool

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For those who follow, I leave you with this quote. Let it guide you as it has guided me:

> *"Beyond a wholesome discipline, be gentle with yourself.*
> *You are a child of the universe, no less than the trees and the stars;*
> *you have a right to be here.*
> *And whether or not it is clear to you,*
> *no doubt the universe is unfolding as it should."*
> Max Ehrmann – Desiderata.

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Glossary

The words presented in this glossary are an important part of the vocabulary used in this thesis. Do note that these words may have different connotations in other domains. Words in italics are glossary entries.

Artefact
> "[…]artefacts, namely *constructs* (e.g. concepts, terminologies, and languages), *models, methods*, and *instantiations* (i.e., concrete solutions implemented as prototypes or production systems)" (Österle et al., 2010).

Appropriate behaviour
> For the behaviour of a person to be considered appropriate, a *group* of people should agree on whether certain behaviours are suitable in a specific *context*. *Culture* will influence what people consider suitable, so, for a similar context, people from different cultures may have a different opinion on the appropriateness of certain behaviours.

Constructs
> "Constructs or concepts form the vocabulary of a domain. They constitute a conceptualization used to describe problems within the domain and to specify their solutions. They form the specialized language and shared knowledge of a discipline or sub-discipline" (March & Smith, 1995). In this work, we use constructs to describe important terms relevant to creating *critical incidents* involving *intelligent agents* that show *culturally varying behaviour*.

Context
> The collection of physical elements that are particular to an *interaction*, for example the environment or the people present. Different levels of importance may be attributed to these elements, based on the *cultural background* of the people present during an interaction. This will influence how those people will perceive, interpret, and behave during that interaction.

Computational model of culture
> A computational model of culture is a *model* based on theories of *culture*, through *model-driven approaches*, or empirical data of cultural differences, through *data-driven approaches*. Such a model is typically incorporated in an agent-based architecture.

Through this computational model, the behaviour of *intelligent agents* can be varied to make it more or less representative of *appropriate behaviours* in certain cultures.

Critical incident

An *interaction* between two or more people or *intelligent agents* from different *cultures*, in which a participant of the interaction, or a bystander, is likely to misinterpret the behaviour of one or more of the participants.

Cultural background

The *culture* of the society or societies from which a person originates. This primarily refers to those societies that have played an important role in determining the deepest *values* of that person. In this work, the cultural background is primarily used to refer to the national culture of a person. This is expressed by the specific numerical values on the *dimensions of culture* for that nationality.

Cultural script

The *simulated culture* of an *intelligent agent*. This script contains a set of rules that help agents to determine how they should perceive, interpret, and behave in different *contexts*. In this work, the cultural script is primarily used to refer to the national *culture* that is to be simulated. The rules are thus influenced by the specific numerical values on the *dimensions of culture* for that nationality.

Cultural meta-norm

A cultural meta-norm is a rule that, based on the *cultural script* of an *intelligent agent* and the *context*, changes the salience of *moral circles* and *social norms*, and the weighting of *relational primitives.*

Cultural misunderstanding

A misinterpretation of the intention behind the behaviour of somebody from another *culture*, due to a difference in culture that someone may or may not be aware of. This may lead to conflicts or the creation of negative stereotypes.

Cultural modifier

A formula used to calculate the effect of *culture* on how much *social importance* is *attributed, conferred,* or *claimed* by *intelligent agents* with a specific *cultural script*. A computational form of *cultural meta-norms*.

Culturally varying behaviour

Behaviour that is rooted in cultural differences.

Culture
   "Culture is the collective programming of the mind that distinguishes the members of one *group* or category of people from others" (G. Hofstede, Hofstede, & Minkov, 2010).

Culture-specific training
   Intercultural training that aims to make trainees more competent in interacting with people from specific *cultures*.

Culture-general training
   Intercultural training that aims to make trainees more competent in interacting with people from a wide range of *cultural backgrounds*.

Data-driven approach
   "In the data-driven approach, *computational models of cultural behaviour* are based on annotated multimodal recording of existing *cultures* from which culture-specific behaviour profiles are learned" (André, 2014).

Dimension of culture
   An aspect of cultural differences, represented by a sliding scale between two extremes. In the latest version of Hofstede's dimensional model (G. Hofstede et al., 2010), six dimensions were derived from empirical data of people from different *cultures*. The dimensions are not used to describe psychological differences, but rather describe nationality level differences. Each country thus has a specific value for each dimension.

Educational scenario
   A sequence of *critical incidents* that happens within an educational tool, designed for trainees to achieve a specific educational objective. Used in this work to describe the scenarios that help trainees increase their *intercultural competence* by interacting with *intelligent agents*.

Experiential training
   Intercultural training that aims to increase the *intercultural competence* of trainees by making them experience real-life *interactions* between people from different *cultures*.

Factual training
   Intercultural training that aims to increase the *intercultural competence* of trainees by providing them with factual information about different *cultures* (Cushner & Brislin, 1997). Originally coined 'didactic training', but as we feel that the term didactic is misleading, we use 'factual training' throughout this work instead.

Feedback
> Sensory information given by a system intended to reduce the discrepancy between the current state of the user, and the intended state of the user. Used in this work to describe the information that trainees receive during and after *critical incidents* to increase their intercultural competence.

Generalizable rules for behaviour
> Formalized rules for *intelligent agents* through which the *appropriate behaviour* for a wide range of *contexts* can be determined.

Group
> "A group is defined in terms of those who identify themselves as members of the group" (Reicher, 1982). In intercultural situations there may be a mismatch, as, for example, a person might not identify him or herself as part of a group, while the members of that group do identify him or her as a member.

Instantiation
> "An instantiation is the realization of an *artefact* in its environment. […] Instantiations operationalize *constructs, models,* and *methods*. […] Instantiations provide working artefacts" (March & Smith, 1995).

Intelligent agent
> "An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators" (Russel & Norvig, 2003). In this work, an intelligent agent refers to an embodied *virtual character* that uses an agent-based architecture to drive perception, interpretation, and behaviour. Both the agent and the environment are subject to change throughout the *critical incidents*.

Interaction
> The exchange of reciprocal actions between two or more people and/or *intelligent agents*.

Intercultural competence
> The ability of people to successfully interact with people from different *cultural backgrounds* than their own. This may happen through a combination of a heightened sensitivity towards cultural differences, additional knowledge of cultural differences, and an increased capacity to act out specific *culturally varying behaviours*.

Intercultural training
> A set of activities that aim to increase the *intercultural competence* of trainees.

Manifestations of culture

Cultural differences can manifest themselves in different ways, ranging from *practices*, i.e. symbols, heroes, and *rituals*, which are more visible to outsiders, to *values*, which are less visible to outsiders (G. Hofstede et al., 2010).

Method

"A method is a set of steps (an algorithm or guideline) used to perform a task. Methods are based on a set of underlying *constructs* and a representation of the solution space" (March & Smith, 1995).

Model

"A model is a set of propositions or statements expressing relationships among *constructs*" (March & Smith, 1995).

Model of culture

A *model* of culture is a theoretical description of *manifestations of culture*, often based on theories of culture or empirical data on differences in behaviours across cultures. The scope of the model is determined by the object to be *simulated*, such as *virtual characters* in a specific *context*.

Model-driven approach

In a model-driven approach, *computational models of culture* are based on existing theories or *models of culture*.

Moral circle

"The boundary drawn around those entities in the world deemed worthy of moral consideration" (Laham, 2009). In this work, a moral circle consists of three elements: "the people to whom it applies, their mutual perceptions of social attributes (or *relational primitives*), and the *social norms* that regulate their behaviour" (Degens, Hofstede, et al., 2014). Moral circles thus only exist in the eye of the beholder.

Moral circle status

Moral circle status represents the formal or informal hierarchy of people within *moral circles*. Differences in hierarchy will affect the behaviour of individuals. For example, depending on where you are from, an elderly person may not be treated similarly as a youngster; it is the same for a boss and an employee. This is a different concept of 'status' than is used in Kemper's work (Kemper, 2011), which is instantiated as *social importance* in our work.

Moral circle reputation

Moral circle reputation represents the social standing of people within *moral circles*. Differences in standing will affect the behaviour of individuals. For example,

depending on where you are from, if a friend has just committed a crime, you may not treat him the same as before.

Parameterisation

The act of adapting the variables of formulas, such as those in a *computational model of culture*, so they can be used in specific *contexts*.

Practices

Practices are the outer layer of *manifestations of culture* and consist of symbols, heroes, and *rituals*. "Practices are visible to an outside observer; their cultural meaning, however, is invisible, and lies precisely and only in the way these practices are interpreted by outsiders" (G. Hofstede et al., 2010).

Relational primitives

"Relational primitives are social variables that exist within the mind of the individual and describe the relational properties of other individuals" (Degens, Hofstede, et al., 2014). In this work, we differentiate between *moral circle status* and *moral circle reputation* as relational primitives.

Ritual

The process of exchanging *symbolic actions* between two or more people during an *interaction* (Rothenbuhler, 1998).

Proof of concept

This refers to the feasibility testing of a preliminary version of an *artefact*.

Scripted scenario

An *educational scenario* in which the sequence of events is predefined by a designer, instead of occurring autonomously, as would happen when *intelligent agents* are used.

Self-contained training tool

A tool that can be accessed at any time in any place without needing external parties and that contains all elements necessary for successful training.

Simulation

A simplification of a real-world system highlighting certain aspects while omitting others (Crookall & Saunders, 1989). Used in this work to refer to the simulation of *intelligent agents*, which are supposed to simulate real world individuals, and *critical incidents*, which are supposed to simulate real world *interactions*.

Social importance

    Referred to by Kemper as status, and represents "the acts or means by which the scalar standing, worth, prestige, honour of a person or social position is conveyed in *interaction*" (Kemper, 2011). Later named social importance, and implemented as a numerical value, to avoid confusion with other connotations of the word status (Mascarenhas, Prada, Paiva, & Hofstede, 2013).

Social importance attribution

    The process of a social entity ascribing a certain amount of *social importance* to another social entity, based on their *relational primitives*.

Social importance claim

    An action that requires a certain amount of *social importance*, in the eyes of the target of the action, for the action to be considered appropriate within a given *context*.

Social importance conferral

    An action that conveys a certain amount of *social importance* to the target of the action, within a given *context*.

Social norm

    Rules that help determine *appropriate actions* in an *interaction*. They enable a person or *intelligent agent* to select certain actions over others depending on the *context*.

Socio-cultural agent

    An *intelligent agent* that is able to act appropriately in groups with people from different *moral circles* and people from different *cultures*.

Symbolic action

    An action that, besides its physical effect, also has a particular social function that can be understood by a *group* of people that agree on the connotation of the action.

Values

    "Values are broad tendencies to prefer certain states of affairs over others" (G. Hofstede et al., 2010). These tendencies are usually unconscious in contrast to convictions. The latter are consciously 'held' by individuals and can vary greatly between culturally similar individuals.

Virtual character

    A virtual character is a digital individual, mainly used in digital training tools or games. It may or may not be driven by an agent-based architecture, depending on how the character has been designed.

Chapter 1

General Introduction

*"The use of travelling is to regulate imagination by reality,
and instead of thinking how things may be,
to see them as they are."*
Samuel Johnson

1.1 Introduction

Peter wanted to experience the world; he had never been abroad in his life, but he had heard many interesting adventures from his friends. He took the leap, and decided to book a trip to a remote village somewhere far away. Once there, it was not quite as he expected. He felt that people stared at him when he was not looking, but shied away when he wanted to talk to them. One time, when he was lost, he tried to approach an elderly man and people started shouting at him. As a result, he felt lonely and misunderstood, and spent the rest of his trip in his room. He vowed never to return to that unfriendly place…

People from all over the world must live and work together in today's society. However, as Peter experienced in the story above, such integration is not always a smooth process and cultural differences can lead to misunderstandings or even outright conflict. This in turn may hinder future interactions with people from that culture, or even with those from other cultures, through the creation of negative stereotypes.

Intercultural training can play an important role in aiding people to deal with such misunderstandings (Black & Mendenhall, 1990). Training may help people to become more sensitive to cultural differences and the emotions of others, give people a greater understanding of cultural differences, and teach people which behaviours are appropriate in a specific culture (Chen, 1997; Gudykunst, Guzley, & Hammer, 1996). This process usually involves showing trainees that people from other cultures may perceive, interpret, and behave differently from what is appropriate in their own culture.

When designing an intercultural training session, there are two different aspects to consider. On the one hand, there is the process side, which deals with the 'how' of training, and on the other hand, there is the content side, which deals with the 'what' of training.

Concerning the 'how', we can differentiate between experiential and didactic approaches (Cushner & Brislin, 1997). Experiential training focuses primarily on having trainees experience how people from different cultures interact with each other, e.g. through role-playing. Didactic training focuses primarily on giving trainees factual information about other cultures, e.g. through lectures.

Concerning the 'what', we can differentiate between culture-specific and culture-general approaches (Cushner & Brislin, 1997). Culture-specific training focuses on having trainees interact with people from a specific culture or giving trainees factual information about that culture, e.g. a training course that helps employees of companies to live and

work in Oman. Culture-general training focuses on having trainees interact with people from a broad range of cultures or giving trainees factual information that applies to a broad range of cultures, e.g. a training course that aims to teach people to deal with the negative emotions that may arise from misunderstandings or conflicts due to differences in culture.

Whatever the 'how' or 'what', intercultural training often requires professional trainers to lead training sessions, and, in the case of experiential training, professional actors or fellow trainees to participate.

In experiential training, a trainer will typically guide a group of trainees through a set of activities. These activities usually entail a simulation of a social environment, and include one or multiple occurrences of cultural misunderstandings. An example of culture-general experiential training is BaFá BaFá (Shirts, 1995).

In BaFá BaFá, trainees are divided into two groups. Both groups have different values; one group favours interpersonal relationships (through the exchange of coins), while the other group favours competing with each other (through trading cards to win a game). Both groups also have practices that reflect these values. After the groups have learned and practised how people from their culture should behave, they then play a 'card game' with members from the other group. Because both groups have different behaviours that they consider appropriate, and their card games have group-specific meanings hidden below superficial similarities, misunderstandings and conflicts may arise.

After going through the activities, participants have the opportunity to share their experiences and interpretations, and trainers try to explain how these experiences relate to each other and to theories of culture and social interaction.

In didactic training, on the other hand, a trainer will typically discuss examples and theories in a classroom setting. One of the possible activities is showing the trainees descriptions of interactions between people from different cultures, which are supposed to be representative of real-life interactions. An example of culture-specific didactic training is the *culture assimilator* (Fiedler, Mitchell, & Triandis, 1971). Culture assimilators are collections of critical incidents that are valid for a certain pair of cultures. These incidents have certain characteristics (based on Flanagan's work (1954)):

> *"For the purpose of developing culture assimilators, the ideal incident must describe (a) common occurrence in which [somebody from a certain culture] and [somebody from another culture] interact, (b) a situation which [somebody from a certain culture] finds conflicting, puzzling, or which is likely to misinterpret, and (c) a situation which can be interpreted in a fairly unequivocal manner, given sufficient knowledge about the culture"* (Fiedler et al., 1971).

After a trainee has read the descriptions of the interactions, he or she can then choose between a set of possible clarifications as to why the misunderstanding happened. One of these clarifications is considered correct. This choice is followed by feedback ex-

plaining the difference between their perception of what happened during the interaction and what actually happened. Learning happens in three stages: first, when the trainee understands that their assumptions about the behaviour within the critical incident are incorrect; second, when the trainee understands which assumptions they should have made; and third, when the trainee understands on which observations these assumptions can be based.

Since didactic training can take a written and passive form, it is easily accessible to people who are interested in the subject. Instead of attending an on-site training session, they may just read a book filled with examples of interactions between people from different cultures. A complicating factor of experiential training on the other hand is that participants, actors, and trainers usually have to be in the same location at the same time during the training sessions, particularly if they have to interact in some fashion. This may make these training sessions difficult to organize for the trainer, expensive for the participants to attend, and time-consuming for all those involved.

Researchers have applied Information and Communication Technology (ICT) to design digital solutions to mediate these complications (Lane & Ogan, 2009). Instead of using human actors or participants, experiential digital training tools usually feature so-called *intelligent agents*, which can interact with each other and/or trainees in a simulated environment, to emulate real-life interactions. These intelligent agents then use a set of rules that help them to determine which behaviours are considered appropriate for a specific culture (these rules are represented in a cultural script).

An example of such a training tool is ELECT BiLAT (Hill et al., 2006), in which American army soldiers are prepared for conducting bilateral negotiations with people from Iraq. In this case, trainees negotiate with intelligent agents that act out believable Iraqi behaviour. Another example, TLCTS (Johnson & Valente, 2008), focuses on teaching skills in foreign languages and cultures. Each version of TLCTS prepares trainees within a specific cultural context, by having them interact with intelligent agents that behave appropriately for that culture.

As these agents are not controlled directly by a human, and need to change their behaviour depending on their cultural script and the context they are in, they need some way to make decisions to ensure that they can show appropriate behaviours for a given culture. This requires an agent-based system, through which agents can observe the environment and act upon it to achieve certain goals (Russel & Norvig, 2003). This then needs to be augmented with a computational model of culture, which can influence the perception, interpretation, and behaviour of the agents depending on a certain cultural script. Do note that an outsider will only see the resulting behaviours, and not the underlying processes needed to determine those behaviours.

A first step to create such agents would be to establish the range of behaviours that need to be incorporated into such a system. Allwood and Ahlsén (2009) discuss features of communication that need to be present in multimodal intercultural ICT. Among oth-

ers, they posit that it is important to represent cultural variation in expressive behaviour, perception, understanding, and interactive features.

There are currently two different approaches to determine such features of communication: data-driven and model-driven approaches (André, 2014). Data-driven approaches extract culture-specific behaviour from existing corpora. The Cube-G project for example (Endrass, Andre, Rehm, & Nakano, 2013), uses recorded videos of interactions between people from Germany and interactions between people from Japan to establish appropriate German and Japanese behaviours for intelligent agents. Model-driven approaches instead generate culture-specific behaviour using theoretical or empirical models of culture. Work by Mascarenhas et al. (2010) for example, uses the dimensions of culture as determined by Hofstede et al. (2010), to generate culturally varying behaviour in agents.

As of yet, there are few digital intercultural training tools that focus on educating trainees about cultural differences by having them interact with intelligent agents. This may be because of the intrinsic difficulty of modelling realistic and believable behaviours for a wide range of cultures (André, 2014). Data-driven approaches, which ground the behaviours in empirical data, are not practical to use, as the amount of time required to create corpora for a wide range of cultures would be immense. Model-driven approaches are still relatively new, and it is not yet clear how the behaviours generated by the designer's interpretation of the models of culture should be validated.

While difficult to create, a tool for training about differences across a wide range of cultures would have many benefits. Those who are not able to follow, or afford, a regular intercultural training course would be enabled to further their capacity to work together with people from a wide range of other cultures by experiencing how misunderstandings can shape interactions with and perceptions of people from other cultures.

In this thesis, we focus on the design of a digital experiential culture-general training tool, using a model-driven approach, that can be accessed by interested parties whenever and wherever they want. This tool should feature activities that promote the interaction between trainees and intelligent agents, which should show behaviour representative of differences across cultures. After these interactions, trainees should become more sensitive to and knowledgeable about cultural differences.

1.2 Design Methodology

The aim of our work is to change an existing situation, a lack of intercultural competence of a person, into a preferred situation, a presence of intercultural competence in that person. This should be achieved by having trainees interact with an artificially created product, i.e. an artefact, in this case a digital intercultural training tool. The design of such an artefact is the core of design science (Klabbers, 2006; March & Smith, 1995; Simon, 1996).

In contrast to natural science, design science does not focus on understanding reality by determining the 'how' and 'why' of things, but instead focuses on the creation of artefacts to help solve real-world problems (March & Smith, 1995). Such a fundamental difference in nature also leads to a fundamental difference in outputs. As March and Smith state: "progress [in natural science] is achieved as new theories [deep principled explanations of phenomena] provide deeper, more encompassing and more accurate explanations". Instead, design science is concerned with "producing and applying knowledge of tasks or situations in order to create effective artefacts" (March & Smith, 1995)[1]

The goal of design science is thus not to generate and validate new theories. March & Smith (1995) describe instead four different outputs: constructs, models, methods, and implementations. Constructs, or concepts, provide the basic language required to describe phenomena, models can be used to describe the relationship between constructs, methods help to describe how tasks are or should be performed, and implementations are the instantiation of the other outputs in a working application. These outputs are very similar to the different types of artefacts as described by Österle et al. (2010), except that they use the term instantiations instead of implementations.

These outputs focus on the 'what' of design science, but they do not focus on the 'how'. Researchers have created a model for design science research, see Figure 1.1, that tries to describe how design artefacts are generated through the integration of knowledge, design, and the real-world (Hevner, March, Park, & Ram, 2004; Hevner, 2007).

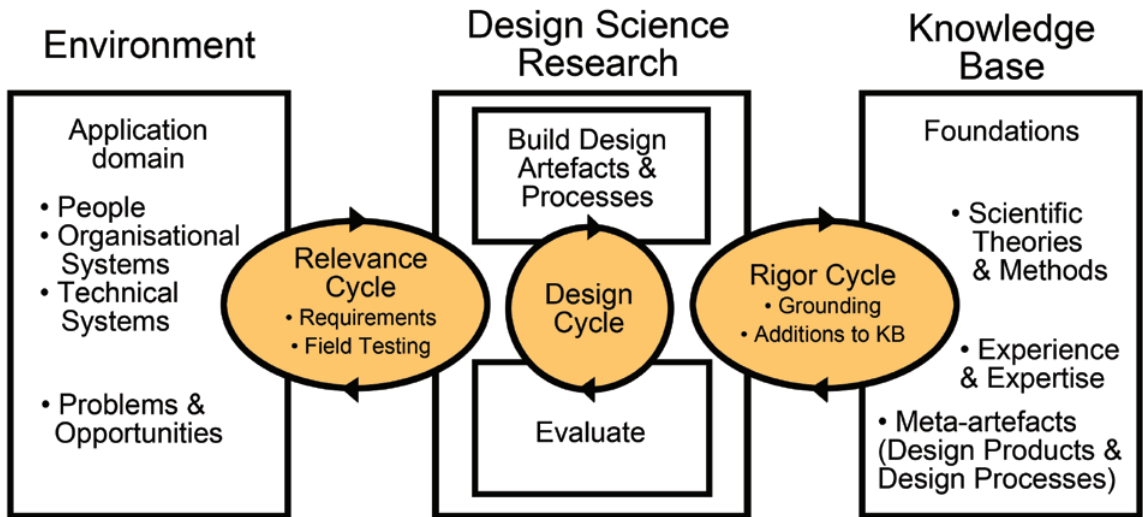**Figure 1.1: Hevner's Design Science Research Cycles (Hevner et al., 2004; Hevner, 2007).**

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1   These two types of science are actually two sides of the same coin. As Hevner et al. (2004) mention in their work: "The goal of behavioural science research is truth. The goal of design-science research is utility. […] our position is that truth and utility are inseparable. Truth informs design, and utility informs theory."

The *environment* is composed of the target audience, the as-is situation, the problem and opportunities, and indirectly, the to-be situation. The *knowledge base* is comprised of formal knowledge from relevant disciplines, previous experiences of those involved in the design process, and relevant artefacts and design processes. *Design science research* integrates elements from the knowledge base and the environment to build and evaluate artefacts and processes.

The environment and design science research feed into each other through the *relevance cycle* to ensure that the artefact can be used to change a current situation into a preferred situation. As such, its use is twofold: through the interaction between the design cycle and the environment, we can identify design requirements based on the current situation and we can test whether our artefact can realize the intended effect in the real world.

The knowledge base and design science research feed into each other through the *rigour cycle*. Its use is twofold. On the one hand, we can select theories and methods that inform and ground our design process. This will ensure that state-of-the-art artefacts are designed. On the other hand, we can complement the current knowledge base with new theories and/or outputs of design science.[2]

The goal of the *design cycle* is to integrate the elements from the knowledge base and the environment to create artefacts that can be used to realize the intended effect. The design cycle is often an iterative process of development and evaluation.

Both the outputs of design science and Hevner's model of design science research form the methodological basis of this work, and have been used to formalize the steps that have been conducted throughout this work.

Since Hevner does not specify the design cycle, we use the ADDIE model (Morrison, Ross, Kemp, & Kalman, 2010) as the basis for the steps taken in the design cycle. The ADDIE model is traditionally used for the design of instructional systems, and is comprised of five different phases: analysis, design, development, implementation, and evaluation.

Analysis deals with formalizing different aspects of the problem: who is the target audience, what is the problem, what is the context, and what processes are needed to solve the problem? *Design* deals with the design of concrete learning experiences (based on learning goals). *Development* deals with the development of the designed tools and the integration of necessary technologies. *Implementation* deals with the implementation of the designed tools in the relevant context. The fifth phase *evaluation* deals with the evaluation of design assumptions. It does not only occur at the end of the design cycle; rather, it can be conducted after and during each of the previous four phases to ensure that potential problems are identified as early as possible.

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2   In later work, Hevner and Chatterjee (2010) argue that not all decisions made in the design of an innovative tool may be attributed to validated elements of knowledge, as these elements of knowledge may not yet exist or be incomplete.

Design is not always a straightforward process; one needs to test prototypes (or design assumptions) against the relevant requirements. As a result, the design of a tool is likely to change throughout the design process. These changes generally come about by evaluating (parts of) the design with (a representation of) the target audience. The process is representative of the spirit of critical rationalism (Popper, 1959); design assumptions are tested and adjusted if proven false.

1.3 Research Scope

Developing a fully realized intercultural training tool involves many different aspects, ranging from the selection and analysis of relevant theories to the implementation of the training tool as part of an intercultural training session. In this work, we focus on two important parts of the whole: the creation of intelligent agents that are capable of showing culturally varying behaviour, and the creation of educational scenarios that increase the intercultural competence of trainees.

These two parts were embedded in the European FP7 project eCute[3] , which created showcases that promote cultural understanding and empathy in children and young adults. Of particular note for this work is the Traveller (TRAining for Virtually Every Location for Learning Empathic Relationships) showcase, in which young adults interact with intelligent agents in a broad range of cultural settings.[4]

To create this showcase, partners from eight universities worked on different components. One set of partners focused on implementing the behaviour of the intelligent agents in a virtual environment, while another set of partners focused on the use of innovative interaction modalities, such as the Microsoft Kinect, to interact with the agents.

The work in this thesis mainly revolves around creating a practical solution that ensures that potential trainees become more sensitive towards and gain a greater knowledge of differences in cultures. This change should occur by confronting them with critical incidents in which misunderstandings due to cultural differences take place based on theories from intercultural training. These incidents need to involve intelligent agents that use (computational) models to show culturally varying behaviour that is representative of cultural differences. This requires the behaviour of the agents to be believable and realistic, which can only be done by utilizing relevant theories of culture, psychology, and social interaction to drive the perception, interpretation, and behaviour of the agents. The flow of the above activities can be found in Figure 1.2.

The interactions should take place in a 'virtual world', which is 'inhabited' by intelligent agents. This virtual world should be similar to the real world, to ensure that the interactions will lead to a change in the real-world behaviour of the trainees (also known

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3   http://www.ecute.eu
4   http://www.ecute.eu/traveller/

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Figure 1.2: Flow of the research (including design research questions).

as *transfer of learning*). However, at this moment, it is not yet possible to capture the full complexity of our own social interactions in such a system; unfortunately we cannot 'make a copy' of a real person and put that copy into a computer system.

This requires us to create simulations, which are simplifications of a real-world systems, that highlight certain aspects while omitting others (Crookall & Saunders, 1989). In this case, our aim is to simulate interactions between individuals from different cultures.

An important part of the scope of this work is thus to define the constructs, models, and methods that are necessary to ensure that the interactions with the agents will feel similar to real-life interactions with people and that the critical incidents involving the agents lead to a change in the user.

1.3.1 Design Research Questions

As described by March and Smith (1995): "Constructs, or concepts, form the vocabulary of a domain". They can be used to define elements required to both describe and solve the problem. They are particularly relevant for innovative research, as there is no pre-existing common language yet defined.

A vocabulary is particularly important in this field of research, as one has to work with researchers from a wide range of disciplines, both theoretical and technical. Seemingly simple words can have a completely different connotation to somebody from another discipline, not to mention different connotations that may arise due to differences in culture.

Besides the communicative value of a vocabulary, it can also help to increase the visibility of related work. This is a particularly difficult problem for researchers new to the field, as they are unaware of the keywords that are relevant to a certain domain.

As such, it is important to determine the concepts that are relevant to designing both the intelligent agents and the culture-general training tool they 'inhabit'.

The first design research question is thus:

Design Research Question 1 (DRQ1) – Which concepts are required to describe the design of a digital culture-general training tool involving agents that show culturally varying behaviour?

Intelligent agents are an important part of this work, as they are vital to the success of a self-contained culture-general training tool. As the goal of our training tool is to educate about differences across a wide range of cultures, we need to ensure that the intelligent agents can adapt their behaviour depending on the cultural variations that we would like to represent. This requires a model-driven approach, in which we somehow use theories of culture and models of culture to determine the specific behaviours of intelligent agents.

An important first step in conducting research in a new problem area is checking whether the intended concept is actually feasible (March & Storey, 2008). We should thus create a prototype in which intelligent agents show behaviour that is appropriate for a given culture based on theories of culture. This will help us to gain a greater insight into the method required to create these agents, and the necessary implementation of these behaviours.

Since this part involves a feasibility study, we do not yet need to make a computational model of culture. Rather, the flow of agents should be scripted, i.e. pre-defined, to evaluate if people from a wide range of cultures are actually able to perceive the intended cultural differences from the behaviour of those scripted agents.

In this work we will use Hofstede's dimensional model (G. Hofstede et al., 2010) to determine appropriate behaviours for a wide range of cultures. There are a few reasons for this choice. First of all, as Harry Triandis stated in his foreword to the work of Hofstede et

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al. (2002): "[…] it has been shown (Bhawuk, 1998) that theory-based cross-cultural training is more effective than training that consists of scattered samples of beliefs, attitudes, and experiences. Why? It is easier for the learner to absorb the material and generalize to new situations if the training is based on theory". This is further argued by Fowler and Pusch (2010). Secondly, it is based on a wide range of empirical data, and continually updated to reflect new data sources. Thirdly, it has shown continued validity, as argued in a review of empirical research using Hofstede's dimensions (Kirkman, Lowe, & Gibson, 2006). Lastly, we had the opportunity to work together with one of the authors of ´Cultures and Organisations´ (G. Hofstede et al., 2010), Gert Jan Hofstede, and other researchers who have been working on the implementation of Hofstede's dimensions into agent-based systems, which would help to interpret the dimensions.

The second design research question is thus:

Design Research Question 2 (DRQ2) - Can we use theories of culture to create scripted scenarios in which virtual characters behave appropriately for a given culture?

There are two parts to formalizing the process of generating culturally varying behaviour in intelligent agents. They need a simulated world to live in, and they need some way to navigate through that world. If we equate an intelligent agent to a tourist, then they need a map telling them where they are, and they need to be able to decide on a route that guides them to all the important landmarks.

To ensure that the agents can make sense of their interactions with individuals from different cultures, we should first define the social world they live in. While this world should incorporate elements from our own social world, it will be severely limited in comparison, as it is, as of yet, impossible to model the full complexity of reality.

Based on this social world, it is then important to identify what would be required in the design of socio-cultural agents, to ensure that they can make sense of their social world. For instance, the appropriateness of an action may change depending on the physical location it is being acted out in, so a socio-cultural agent needs to be aware of its environment. Establishing these requirements, and defining the social world of the agents, can only be done through an analysis of theories of culture, psychology, and social interaction.

The third design research question is thus:

Design Research Question 3 (DRQ3) - Can we identify requirements for socio-cultural agents that can help them to make sense of their social world?

The next step is to help the intelligent agents to navigate through their social world. They should be able to take decisions autonomously, based on the requirements identified in DRQ3. This requires the creation of generalizable rules for behaviour that can be parameterised according to cultural differences and for specific contexts. Since the goal of the training tool is to educate trainees about differences in culture, it is important that

these rules for behaviour can be used to generate behaviour appropriate to the culture that is to be simulated. To ensure that the intelligent agents behave appropriately for a given culture, we need to empirically evaluate the resulting behaviour of the agents with people from that culture.

The fourth design research question is thus:

Design Research Question 4 (DRQ4) – Can we create intelligent agents that can vary their behaviour depending on the culture to be simulated?

To increase the capability of (potential) trainees to deal with misunderstandings that arise due to cultural differences, we would need to incorporate the intelligent agents from DRQ4 into a set of critical incidents. Their shape and flow should be informed by and grounded in theories on intercultural training. It is vital that the requirements identified in DRQ3 are incorporated into the design of the incidents, as it is important that the agents are able to make sense of what happens during these incidents.

The resulting critical incidents should be evaluated by having potential trainees go through the training tool, and check whether the tool is able to make potential trainees more sensitive to and knowledgeable about differences across cultures.

The last design research question is thus:

Design Research Question 5 (DRQ5) - Can we create critical incidents, involving intelligent agents that show appropriate behaviour for given cultures, through which potential trainees become more sensitive to and knowledgeable about differences across cultures?

1.4 Contents of this Research

This work is comprised of a number of chapters, that all target subcomponents of our larger goal, the design of a culture-general training tool involving socio-cultural agents. The results of DRQ1 can be found in the glossary. Chapter 2 describes the design of scripted virtual characters based on theories of culture, and covers DRQ2. Chapter 3 describes both the social world of the socio-cultural agents and requirements that need to be met to ensure that the agents are able to make sense of that world; DRQ3 is covered in this chapter. In Chapter 4, we describe the design of intelligent agents that show culturally varying behaviour, and this covers DRQ4. Chapter 5 describes the design of a culture-general training tool, using the intelligent agents from Chapter 3, and covers DRQ5. In Chapter 6, we will briefly summarize the answers to our design research questions and discuss their contributions to the knowledge base, the limitations of our work, and directions for future work.

Chapter 2

User Testing Culture-specific Behaviours across Cultures

"Have you ever considered, beloved other,
how invisible we all are to each other?
Have you ever thought about how little we know each other?
We look at each other without seeing.
We listen to each other and hear only a voice inside.
The words of others are mistakes of our hearing,
shipwrecks of our understanding.
How confidently we believe in our meanings
of other people's words."
Fernando Pessoa (translated by Richard Zenith)

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Abstract

Integrating culture into the behavioural models of virtual characters requires knowledge from very different disciplines such as cross-cultural psychology and computer science. If culture-related behavioural differences are simulated with a virtual character system, users might not necessarily understand the intent of the designer. This is, in part, due to the influence of culture on not only users, but also on designers. To gain a greater understanding of the instantiation of culture in the behaviour of virtual characters, and on this potential mismatch between designer and user, we have conducted two experiments. In these experiments, we tried to instantiate one dimension of culture (Masculinity versus Femininity) in the behaviour of virtual characters. We created four scenarios in the first experiment, and six in the second. In each of these scenarios, the same two characters interact with each other. The verbal and nonverbal behaviour of these characters differ depending on their synthetic culture. In two user perception studies, we investigated how these differences are judged by human participants with different cultural backgrounds. Besides expected differences between participants from Masculine and Feminine countries, we found significant differences in perception between participants from Individualistic and Collectivistic countries. We also found that the user's interpretation of the character's motivation had a significant influence on the perception of the scenarios. Based on our findings, we give recommendations for researchers that aim to design culture-specific behaviours for virtual characters.

2.1 Introduction

Virtual characters hold great potential for the field of intercultural training. As intercultural training can be expensive and difficult to organise, virtual characters could replace real-life actors and trainers to create educational tools that can be used by trainees whenever and wherever they want.

Such characters need to be programmed to show appropriate culture-specific behaviour. To do this, one must understand how culture influences behaviour and be able to apply that knowledge to create computational models of culture-specific behaviour that determine the behaviour of those characters.

Even if the implemented culture-specific behaviours are based on extensively validated theories from cultural psychology, there is no guarantee that these behaviours will be perceived by human participants as appropriate; the designer's intention might not be perceived or understood by the users. This is, in part, because culture affects the perception and interpretation of both designers and users. Such problems are especially likely to occur when designing for people with different cultural backgrounds than those of the designers.

For this article, we conducted two experiments that provide us with a deeper insight into two processes. The first process is about the modelling and instantiation of culture in the behaviour of virtual characters. The second process is about the perception of this instantiated behaviour by human participants. Specifically, we investigated how the behaviour of virtual characters is judged by participants from different cultural backgrounds.

This article is structured as follows: In the *related work section*, we give a brief overview of research that integrates culture in the behaviour of virtual characters. In the *theoretical background section*, we give a description of the underlying model of culture that we use in the rest of the article. The next two sections describe, respectively, the *first and the second experiment*. In both of these sections we: show how we have applied the model of culture to create different scenarios featuring virtual characters with different synthetic cultures, describe the evaluation procedure, present the results and discuss the outcomes. We end the article with some *conclusions and recommendations* for designing culture-specific behaviours for virtual characters.

2.2 Related Work

To create virtual characters that show appropriate culture-specific behaviour, different aspects of human behaviour need to be considered. Some researchers have focused on formalising verbal behaviour. For example, the Tactical Language and Culture Training System (TLCTS) (Johnson, Marsella & Vilhjálmsson 2004) focuses on training competencies for military purposes and training skills in foreign languages such as Iraqi Arabic, Dari or Pashto (Johnson & Valente 2008). In the TLCTS, trainees have to learn a foreign language in order to complete the tasks provided by the system.

Kim et al. (2009) introduce the BiLAT system that focuses on teaching intercultural skills in order to communicate with people from Iraq. The user has to adapt to interaction rules that are appropriate in Iraq and use those interaction rules to successfully negotiate with simulated Iraqi characters.

Another example of integrating verbal aspects of culture-specific behaviour is work carried out by Endrass et al. (2011b). Focusing on topic selection and dialogue structure in small talk situations, they investigated culture-related differences between participants from Germany and Japan.

Other researchers have focused on nonverbal behaviour such as facial expressions, gesture selection, expressivity, spatial behaviour, and gaze. Jan et al. (2007), for example, take into account eye-gaze, proxemics and turn-taking to point out differences in behaviour between people from Arab countries and people from the United States. This is done by having users observe a group of virtual characters interacting.

Koda et al. (2008) investigate the perception of virtual characters' appearance by studying the facial expressions of avatars. In a follow-up study (Koda, Ruttkay, Nakagawa & Tabuchi 2010), they focused on different regions of the face (eyes and mouth) and conducted a cross-cultural study in Hungary and Japan. In their results, the authors report that Japanese participants found facial cues in the eye region more important than Hungarian participants, who concentrated more on facial cues in the mouth region.

Mascarenhas et al. (2009) focus on rituals, which are described as symbolic social activities which are carried out in a predetermined fashion dependent on cultural background. For their simulation, two groups of characters were created that follow goals and create plans in order to carry out different rituals.

Aylett et al. (2009) use fantasy cultures (i.e. not based on existing cultures) for their virtual characters. With their work, they take an educational approach to create intercultural empathy in the user.

In our work, we take a more fundamental approach of culture-related research by not focusing on specific learning objectives, but by primarily investigating whether participants perceive the implemented culture-specific behaviours and whether they consider that behaviour appropriate. This effect is likely to occur according to the similarity princi-

ple (Byrne 1971), which states that interaction partners who perceive themselves as being similar are more likely to like each other.

2.3 Theoretical Background

A well-established model of culture is described by Hofstede et al. (2010). Their model consists of six dimensions of values, which describe common issues that every society faces. Participants from different countries were found to have different solutions for these issues, which is represented by the score of their country on those dimensions. Over 70 countries were categorised using this model by assigning a value for each dimension. This model shows, according to Smith (2006), superior continued validation over other dimensional frameworks.

The current version of Hofstede's model consists of the following six dimensions: Power Distance, Individualism versus Collectivism, Masculinity versus Femininity, Uncertainty Avoidance versus Uncertainty Tolerance, Long-term versus Short-term Orientation, and Indulgence versus Restraint. We will only discuss two of these dimensions in detail, as they are most relevant to our experiments.

- Individualism versus Collectivism describes the degree to which individuals are integrated into a group. On the individualist side, ties between individuals are loose, and everybody is expected to take care of him or herself. On the collectivist side, people are integrated into strong, cohesive groups;

- Masculinity versus Femininity describes the distribution of roles between males and females. On the masculine side, people are supposed to be assertive or competitive. On the feminine side, people are supposed to be caring and modest.

The above dimensions deal with values, which are one manifestation of culture. Other manifestations of culture, such as practices, are comprised of elements that are more easily visible to an outsider. Examples of practices are rituals (collective activities that serve a relational purpose) and symbols (messages that carry a similar meaning for all those who belong to a group). These practices are important to consider when designing culture-specific behaviours for virtual characters.

Hofstede et al. introduce *synthetic cultures* (2002), which help to clarify the relationship between the dimensions of culture and practices. These synthetic cultures are based on the extremes of each of the dimensions of culture, and each synthetic culture contains the culture's values, core distinctions, key elements, as well as words with positive or negative connotations. These descriptions can be used to create extreme examples of the culture-clashes that can occur in real life. They also serve as a good basis for designing virtual characters' behaviour, since clear behavioural trends are provided for synthetic cultures.

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Due to the influences of the dimensions on each other, we had to isolate one dimension. We were interested in the user's perception of the distinction between performing and caring, as such distinctions are very important in an educational or work environment. These situations would be a manifestation of the Masculinity versus Femininity dimension. The synthetic culture scripts based on this dimension are called *Mascu* and *Femi*; the following ideas are taken from the description of these two synthetic cultures (G. J. Hofstede, Pedersen, & Hofstede 2002).

The *Mascu* synthetic culture has as core value *winning* and as core distinction the distinction between *men and women*. Key elements are statements such as 'material success and progress are dominant values', '*bigger and faster are better*' and '*failing (at school, at work, in sports, or wherever) is a disaster*'. *Mascu's* are described as being loud and verbal, with a tendency to argue with others. Nonverbally they like physical contact, direct eye contact, and animated gestures. Words with a positive connotation are: career, competition, fight, aggressive, success, winner, force, fast, big, power, and action.

The *Femi* synthetic culture, which is located on the opposite side of the same dimension, has as core value *caring for others, especially the weak* and as core distinction the distinction between *caring and needing care*. Key elements are statements such as 'small and slow are beautiful', 'everybody is supposed to be modest, soft-spoken and empathetic - men and women alike', and 'conflicts are resolved through compromise and negotiation'. Typically, *Femi's* do not raise their voice and like small talk and agreement. Nonverbally they do not take much space and are warm and friendly in conversation. Words with a positive connotation are: caring, solidarity, modesty, compromise, help, love, soft, slow, tender, and touch.

2.4 Experiment 1

2.4.1 Method

As the basis for a scenario, we chose to focus on a conversation between a professor and a student. In this conversation, a female student needs an extension for a deadline, and asks the male professor whether this is possible. To show different culture-specific behaviours in this scenario, we designed two scripts for each character. These scripts contain the verbal and nonverbal behaviours of these characters and they were based on the description of the *Mascu* and *Femi* synthetic cultures described in the previous chapter. Since both characters have their own script, there are four different scenarios in total (see Table 2.1).

The student with the *Mascu* script wants to perform the best she can, and needs an extension to improve the assignment. In contrast, the student with the *Femi* script cares more about her family members than the assignment, and needs an extension because she had to attend an important family event and was unable to finish the assignment on time.

Table 2.1: The student's reason, the professor's response, and the scenario outcome for each of the four scenarios (the student gets no extension in the scenario with a grey background).

Scenario			Reason for needing an extension	Response of professor	Does the student get an extension?
No.	Student	Professor			
1	Femi	Mascu	Family event	Needing an extension because of attending a family event is a weak excuse.	No
2	Mascu	Mascu	Performance	Wanting to perform better is a good reason for needing an extension.	Yes
3	Femi	Femi	Family event	Attending a family event is good reason for needing an extension.	Yes
4	Mascu	Femi	Performance	Professor doesn't understand, but will give an extension if it's important to the student.	Yes

The professor with the *Mascu* script considers improving the assignment a good reason, and will give the student an extension. The same professor considers a family event a weak excuse, and will not give an extension. In contrast, the professor with the *Femi* script considers a family event a good reason, and will give the student an extension. The same professor does not consider it important to improve the assignment, but he will still give an extension if it is important to the student with the *Mascu* script (for all the outcomes, see Table 2.1).

The wording for *Mascu* characters is designed in a direct way, e.g. "No. Everybody knew it had to be handed in today". Vice versa, the utterances of the *Femi* professor's speech focus on caring towards the students and uses soft wording, e.g. "Oh nice, a family event. What was it?"

The nonverbal behaviour also differs for *Mascu* and *Femi* characters. Previous research (Endrass et al. 2011a) describes how participants from different nationalities differ in their prototypical body postures. Based on these findings, we chose more moderate and soft body postures for the *Femi* characters (e.g. folding hands in front of the body, or touching facial regions with the hands, see the left screenshot in Figure 2.1, while we chose upright body postures that use more space for *Mascu* characters (e.g. Arms Akimbo - hands on the hips and elbows bowed outward, or fold arms in front of the body, see the right screenshot in Figure 2.1).

Figure 2.1: Example of the characters interacting in our scenario
(left side: Femi student and Femi professor; right side: Mascu student and Mascu professor).

According to previous work on culture-specific nonverbal behaviour (Endrass et al. 2011a), differences in gestural expressivity of virtual characters such as spatial extent or speed can be found in people from different nationalities. Based on these findings, we used gestures with a larger spatial extent and higher speed for the *Mascu* characters compared to the *Femi* characters.

Communicative gestures also differ between the characters in our scenarios. A pointing gesture performed by a *Mascu* character, for example, can contain pointing at the interlocutor, while a pointing gesture carried out by a *Femi* character points at an imaginary point in space, e.g. behind one's shoulder, to refer to the family event, prototypical culture-specific gestures for virtual characters can be observed here.[5]

To realize the scenarios described above, we used the Virtual Beergarden scenario running in the AAA application (Damian, Endrass, Huber, Bee, & André, 2011). In this application, characters can be loaded that are able to move around in the scenario freely, use gestures, and communicate with each other. Verbal behaviour is realised by a text-to-speech component, while for nonverbal behaviour a set of over 70 animations is available.

Each of the four scenarios lasts for about half a minute (between 23 and 32 seconds) and contains between 6 to 10 dialogue turns. In order to avoid side effects evoked by the gender of the characters, we left the genders of the virtual characters constant over all four scenarios. Figure 2.1 shows the virtual scenario including our professor-student setup with a female (gender) student and a male (gender) professor, showing *Femi* (culture) or *Mascu* (culture) behaviour.

2.4.2 Evaluation Procedure and Hypotheses

To evaluate the perceptions of human participants, we recorded four videos showing each of the four scenarios. After answering demographic questions, such as age, gender, and nationality, participants were able to view all four videos. They were given the opportunity to watch the videos multiple times. Our aim for the evaluation was to discover

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5   http://www.hcm-lab.de/projects/animations

how the implemented culture-related differences are perceived by participants from different countries. Based on the contents of the scenarios, we identified three hypotheses:

Participants from countries that score higher on the dimension of Masculinity will be more likely to…

1.1 …consider the behaviour of characters with the *Mascu* script more appropriate than characters with the *Femi* script;

1.2 …consider getting an extension less fair than not getting an extension, because they will be unforgiving towards underperforming students;

1.3 …like the characters with the *Mascu* script more than characters with the *Femi* script.

To test these hypotheses, we created the following questions, which the participants had to answer after watching each video:

- (1.1) Do you think the student acted appropriately?
- (1.1) Do you think the professor reacted appropriately?
- (1.2) Do you think the professor's decision was fair towards the student who asked for the extension?
- (1.2) Do you think the professor's decision was fair towards other students who did not ask for an extension?
- (1.3) Would you like to have this professor as a teacher?
- (1.3) Would you like to have this student as a friend?

Participants were able to rate these questions on a 7-graded Likert scale, rating their agreement with "yes, absolutely", "yes", "somewhat yes", "neither yes or no", "somewhat no", "no" or "no, not at all". After answering the above questions, participants were also able to further clarify their choices in a comment box.

Using the recorded videos, we created an online survey, and circulated the link to universities of different countries and to people interested in culture. For further information on the study setup, introduction, dialogues, and videos, please visit the online study[6].

2.4.3 Results

In total, 75 participants of 10 different nationalities took part in our study. Since we only collected enough data for statistical analysis of participants from four countries, we only considered the data from those participants. In that manner, 15 people from Germany (7 females; mean age: 27.8; SD age: 3.57), 11 people from Japan (5 females; mean age: 27; SD age: 6.4), 19 people from the Netherlands (7 females; mean age: 23.1; SD age: 3.27), and 20 people from Thailand (11 females; mean age: 28.5; SD age: 3.06) were included for analysis, while 10 participants from 6 other countries were excluded. The scores for the four participating nationalities on Hofstede's dimensions are provided in Table 2.2. As the data was not normally distributed, we used non-parametric tests in all cases.

6   http://mm-werkstatt.informatik.uni-augsburg.de/survey/index.php?sid=21954&lang=en

Table 2.2: Number of participants from each country, and the scores for these countries on Hofstede's dimensions (G. Hofstede et al., 2010). Highest and lowest scores are underlined.

	N	PDI	IND	MAS	UAI	LTO	IvR
Germany	15	**35**	67	55	65	83	**40**
Japan	11	54	46	**95**	**92**	**88**	42
Netherlands	19	38	**80**	**14**	**53**	67	**68**
Thailand	20	**64**	**20**	34	64	**32**	45
Difference between highest and lowest		29	60	81	39	56	28

Appropriateness of behaviour

The dialogue was different depending on the scripts of the characters; it might thus be that the appropriateness of one of the characters was influenced by the other character. This is why we compared each scenario to every other scenario using the Wilcoxon signed-rank test. We found that the participants from Germany and the Netherlands found the *Mascu* student significantly more appropriate (two comparisons for participants from Germany, two comparisons for participants from the Netherlands), and that participants from Thailand found the *Femi* student significantly more appropriate (two comparisons for participants from Thailand). See Table 2.3 for an overview of these results.

To account for differences due to culture, we used the Mann-Whitney U test to compare groups comprised of people from different nationalities. This distribution of participants was done for the Masculinity versus Femininity dimension (Germany and Japan versus The Netherlands and Thailand). We found no significant differences for this dimension. After looking at the data in more depth, we discovered that the Individualism versus Collectivism dimension (Germany and the Netherlands versus Japan and Thailand) had a large effect on perception. With this configuration, we found significant differences with regard to the appropriateness of the characters (see Table 2.4).

Fairness of professor's decision

To determine whether people from certain countries perceived getting an extension as significantly more fair in one of the scenarios, we used the Wilcoxon signed-rank test to compare each scenario to every other scenario.

For the participants from the Netherlands, the fairness of the extension to the student was significantly higher for the *Mascu* student (*Mdn* = 5.5), than with *Femi* student (*Mdn* = 4.0), $T = 15$, $p = 0.030$, in the scenario with the *Femi* professor.

Table 2.3: Comparison of student appropriateness between different scenarios for the participants from different countries. Named scenario was rated significantly higher (the student gets no extension in the scenarios with a grey background).

Scenarios to compare				Country for which the scenarios were compared			
Scenario A		Scenario B		Germany	The Netherlands	Thailand	Japan
Stud	Prof	Stud	Prof				
Femi	Mascu	Mascu	Mascu	Scenario B p = 0.002	Scenario B p = 0.026	-	-
Femi	Mascu	Femi	Femi	-	-	Scenario B p = 0.001	Scenario B p = 0.033
Femi	Mascu	Mascu	Femi	-	Scenario B p= 0.008	-	-
Mascu	Mascu	Femi	Femi	Scenario A p = 0.002	-	Scenario B p = 0.033	-
Mascu	Mascu	Mascu	Femi	Scenario A p = 0.033	-	-	-
Femi	Femi	Mascu	Femi	-	-	Scenario A p = 0.008	-

Table 2.4: Appropriateness of student and professor judged by participants from IND countries, Germany and the Netherlands versus COL countries, Japan and Thailand (the student gets no extension in the scenario with a grey background).

Appropriateness of student				
Stud	Prof	Mean IND countries	Mean COL countries	p
Femi	Mascu	4.03	3.94	0.767
Mascu	Mascu	5.29	4.42	0.013
Femi	Femi	4.26	5.16	0.040
Mascu	Femi	4.94	4.03	0.015
Appropriateness of professor				
Stud	Prof	Mean IND countries	Mean COL countries	p
Femi	Femi	3.39	4.90	< 0.001

We found significant differences with regard to the fairness of an extension towards other students (see Table 2.5). In particular, we found that participants from every country found it less fair towards other students if the student was granted the requested extension. In addition, we found that participants from Germany and Thailand each found the extension significantly fairer in two of the other comparisons (see the bottom three rows in Table 2.5).

Affective reaction to the characters

We analysed if people from certain countries would like the professor as a teacher, or the student as a friend. To determine whether this was more likely if the character had a certain synthetic culture, we used the Wilcoxon signed-rank test to compare each scenario to every other scenario.

The results for liking the professor as a teacher can be found in Table 2.6. Participants from Germany liked the professor as a teacher significantly more in two of the comparisons. Participants from the Netherlands liked the professor as a teacher significantly more in four of the comparisons. Participants from Thailand liked the professor as a teacher significantly more in one of the comparisons. Participants from Japan liked the professor as a teacher significantly more in two of the comparisons. Eight of these nine significant differences can be found when two scenarios are being compared in which the student gets an extension versus the student does not get an extension. In all of these, participants prefer the professor as a teacher in the scenarios in which the professor does not grant an extension.

Table 2.5: Comparison of the fairness of the extension to other students between different scenarios for the participants from different countries. Named scenario was rated significantly higher (the student gets no extension in the scenarios with a grey background).

Scenarios to compare				Countries for which the scenarios were compared			
Scenario A		Scenario B		Germany	The Netherlands	Thailand	Japan
Stud	Prof	Stud	Prof				
Femi	Mascu	Mascu	Mascu	Scenario A $p = 0.011$	Scenario A $p < 0.001$	Scenario A $p = 0.001$	Scenario A $p = 0.017$
Femi	Mascu	Femi	Femi	Scenario A $p = 0.003$	Scenario A $p < 0.001$	Scenario A $p < 0.001$	Scenario A $p = 0.028$
Femi	Mascu	Mascu	Femi	Scenario A $p = 0.005$	Scenario A $p < 0.001$	Scenario A $p < 0.001$	Scenario A $p = 0.007$
Mascu	Mascu	Femi	Femi	Scenario A $p = 0.011$	-	-	-
Mascu	Mascu	Mascu	Femi	-	-	Scenario A $p = 0.023$	-
Femi	Femi	Mascu	Femi	Scenario B $p = 0.013$	-	Scenario A $p = 0.021$	-

Table 2.6: Comparison of liking the professor as a teacher between different scenarios for the participants from different countries. Named scenario was rated significantly higher (the student gets no extension in the scenarios with a grey background).

Scenarios to compare				Countries for which the scenarios were compared			
Scenario A		Scenario B		Germany	The Netherlands	Thailand	Japan
Stud	Prof	Stud	Prof				
Femi	Mascu	Mascu	Mascu	Scenario B $p = 0.012$	Scenario B $p = 0.002$	Scenario B $p = 0.044$	Scenario B $p = 0.011$
Femi	Mascu	Femi	Femi	-	Scenario B $p = 0.038$	-	Scenario B $p = 0.021$
Femi	Mascu	Mascu	Femi	Scenario B $p = 0.018$	Scenario B $p = 0.015$	-	-
Mascu	Mascu	Femi	Femi	-	-	-	-
Mascu	Mascu	Mascu	Femi	-	-	-	-
Femi	Femi	Mascu	Femi	-	Scenario B $p = 0.047$	-	-

Table 2.7: Comparison of liking the student as a friend between different scenarios for the participants from different countries. Named scenario was rated significantly higher (the student gets no extension in the scenarios with a grey background).

Scenarios to compare				Countries for which the scenarios were compared			
Scenario A		Scenario B		Germany	The Netherlands	Thailand	Japan
Stud	Prof	Stud	Prof				
Femi	Mascu	Mascu	Mascu	-	-	-	-
Femi	Mascu	Femi	Femi	-	-	Scenario B $p = 0.006$	Scenario B $p = 0.006$
Femi	Mascu	Mascu	Femi		-	-	-
Mascu	Mascu	Femi	Femi	-	-	Scenario B $p = 0.013$	-
Mascu	Mascu	Mascu	Femi	-	-	-	-
Femi	Femi	Mascu	Femi	-	-	Scenario A $p = 0.010$	Scenario A $p = 0.044$

The results for liking the student as a friend can be found in Table 2.7. Participants from Thailand liked the *Femi* student as a friend significantly more in two of the comparisons. They also liked the *Femi* student more when they were interacting with the *Femi* professor. Participants from Japan liked the student as a friend significantly more in one of the comparisons. They also liked the *Femi* student more when they were interacting with the *Femi* professor. All of these significant differences occur when there is a comparison with the scenario with a *Femi* professor and a *Femi* student (which is also the preferred scenario).

2.4.4 Discussion

We expected to find that the respondents from countries that score high on Masculinity considered the behaviour of the characters with the *Mascu* script more appropriate than the behaviour of the characters with the *Femi* script (Hypothesis 1.1).

This hypothesis was not confirmed by our results. They do show, in some of the comparisons, that participants from countries that score high on Individualism (the Netherlands and Germany) considered the behaviour of the student with the *Mascu* script more appropriate and participants from countries that score low on Individualism (Japan and Thailand) considered the behaviour of the student with the *Femi* script more appropriate (see Table 2.3 and Table 2.4).

For three out of the four scenarios, the participants from Individualistic and Collectivistic countries differ significantly in their perception of the student's appropriateness. The only exception constitutes the scenario with the *Femi* student and the *Mascu* professor, in which an extension was not granted.

We expected to find that participants from countries that score high on Masculinity would think that it is less fair if the student gets an extension (Hypothesis 1.2).

We did not find any significant results concerning the fairness of an extension for the student who requested an extension.

We did find that participants from each country tested found it less fair toward the other students if the student received an extension (Table 2 5). This suggests that the actual outcome of the scenario, e.g. whether an extension is granted or not, had a large influence on the perception of the participants.

We expected that participants from countries that score high on Masculinity would like the *Mascu* professor as a teacher, and the *Mascu* student as a friend (Hypothesis 1.3).

Our results did not confirm this hypothesis. We did find that in two of the comparisons, participants from Thailand would like the *Femi* student significantly more as a friend, and in one of the comparisons, participants from Japan would like the *Femi* student as a friend. We believe this may be due to the importance of modesty in these countries; the *Femi* student showed more respect to the professor than the *Mascu* student did (which is also reflected in the comments; for example: "The reason was personal, but the student

acted respectfully" (participant from Japan)).

While the quantitative data does not confirm our original expectations, the qualitative data does show information which is largely aligned with those expectations. Some participants from countries that score high on Masculinity stated that the *Mascu* professor "acted according to the rules" (participant from Germany) and "the professor made a fair decision" (participant from Japan). Participants from countries that score high on Femininity stated that the *Mascu* professor "is a bit rude" (participant from the Netherlands) and "shouldn't judge too soon" (participant from Thailand). In comparison, the *Femi* professor was judged "kind" and a "nice man" by participants from countries that score high on Femininity, while he was judged "too soft" and "not fair" from participants from countries that score high on Masculinity.

This discrepancy between the qualitative and quantitative data may be due to certain elements, unknown to us, that have a large effect on the perceptions of the participants, but are not captured by the closed questions. By going through the qualitative data, we found that certain comments were made quite often, and by participants from every country. They mainly had to do with the student's reason for needing an extension, and the decision of the professor:

- The student should have known in advance that she would need to attend a family event/need more time, so she should have asked sooner;
- Giving an extension is not fair towards others; the professor should give everybody an extension if he gives it to a single student.

Some examples of the types of comments that frequently appeared: "I think he and she acted appropriately. Her reason is good for extending the deadline, so I feel his decision is OK. But his decision is not fair to other students" (participant from Japan); "While his decision is nice, it is not really fair towards the others, especially since she did not ask in advance but confronted him with the problem after the deadline" (participant from Germany); "The student should've asked for an extension earlier, not on the day the project is due. In that case, she could have worked around it if the professor said no. I understand the professor does not extend her deadline because that would be unfair towards other students. Especially since the student is pretty late with asking for an extension, I think he is right" (Participant from the Netherlands).

The above discrepancies show a clear mismatch between our intentions and the participants' perceptions. Table 2.8 shows this divide in terms of differences in perception and intention. We consider the researcher in our case to be the designer, and the users to be the participants. This table is inspired by 'Johari windows', a simple two-by-two matrix by Joseph Luft and Harry Ingram, originally created to better understand misunderstandings in interpersonal relations (Luft 1970).

Ideally, the *known by both* area should contain as many elements as possible. This reduces the risk that the results will diverge from the initial expectations. However, when

dealing with the culture-specific appropriateness of behaviours, it is unlikely that a designer is able to guarantee this. This is, in part, due to the influence of culture on both the designer and the user, and is especially true when there is a difference in cultural background between designer and user.

Table 2.8: Designer versus User: Differences in Perception or Intention.

		Designer	
		Intended	Unintended
User	Perceived	Known by both	Hidden user-context
	Unperceived	Unperceived by user	Unknown by both

In our experiment, we expected that certain behaviours would be representative of prototypical Masculine and Feminine behaviour. Instead, we found that we might have targeted a different dimension of culture: Individualism versus Collectivism. This represents a typical problem that occurs in the *hidden user-context* and *unperceived by user* areas; users perceived elements that we did not think were important (for example, the modesty of the student), and might not have perceived elements that we thought were important (for example, the specific nonverbal behaviours of the characters, which were not mentioned in the comments).

The student's reason for needing an extension and the professor's decision whether or not to give an extension were two important factors influencing perception. In particular, the fact that the student should have told the professor in advance was an element that we did not consider important (*hidden user-context*). Even though we expected that the fairness of an extension would be an important element of the interaction (*known by both*), we did not expect that the participants from each country would perceive them similarly.

It is possible that the effect of culture does not apply as strongly to the situation in the scenarios: personal experiences of the participants may have influenced their judgements, or these situations might feel unnatural to the participants. The fact that we did not vary the gender of the characters was to keep the results stable. As Masculinity versus Femininity has a large effect on the perceptions of gender roles, we would have to include another set of four scenarios. Since we are not interested in the specific perceptions of gender roles, we decided to keep the gender of the character static. However, we found that none of the participants remarked on the sex of the protagonists in the written comments.

2.5 Experiment 2

The first experiment showed that participants perceived the characters significantly different if the student did or did not get an extension. Our intention was to see whether people from different cultures would perceive the student significantly different if she had a culturally appropriate reason for needing an extension. We found that the participants did mention the student's reason in the comments, but the quantitative data did not reflect this.

Another element that may have had an influence on perception could have been the reference to family (Femi student). In Collectivistic countries, people are integrated into strong, cohesive groups, and in Individualistic countries, people are supposed to take care of themselves. By removing the reference to family, we hope to find differences between participants that score high and low on Masculinity.

In short, for this second experiment we decided to do a follow-up study investigating two elements:

- The influence of the student's reason for needing an extension on the perception of the entire interaction;
- Whether we can target a different dimension of culture (Masculinity versus Femininity) by changing the reason for needing an extension (by removing the emphasis on family).

2.5.1 Method

We added two new scenarios to the original four. In terms of behaviour, these two scenarios are identical to scenarios with the *Femi* student. There was only one difference: instead of the student needing an extension because she had to attend a family event, the student in the two new scenarios needs an extension because of a computer breakdown. In the remainder of this article, we will refer to this *Alternative Femi* student as the student with the *FemiAlt* script. For more information, see the online study[7].

2.5.2 Evaluation Procedure and Hypotheses

The same experimental setup as in the first experiment was used. Participants saw six videos (the original four videos and the two new videos, see Table 2.9).

Our hypotheses for the second experiment were:

1.1 Participants from countries that score higher on Masculinity will be more likely to consider the behaviour of characters with the *Mascu* script more appropriate than characters with the *FemiAlt* script;

1.2 The scenarios with the *FemiAlt* student will be perceived significantly different from the scenarios with the *Femi* student.

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7   http://mm-werkstatt.informatik.uni-augsburg.de/survey/index.php?sid=44443&lang=en

In addition to the questions used in the first experiment, we included two open questions to gain a greater understanding of what the participants consider appropriate behaviour:

- What do you think a good teacher would have done?
- Do you think the student could have finished the project on time?

2.5.3 Results

In total, 81 participants of 31 different nationalities took part in our second study. Since we only collected enough data of participants from six countries for statistical analysis, we only considered the data from those participants. In that manner, 5 people from France (2 females; mean age: 34.20; SD age: 7.6), 5 people from Egypt (3 females; mean age: 21; SD age: 0.71), 10 people from Germany (5 females; mean age: 34.00; SD age: 7.8), 6 people from Russia (4 females; mean age: 29.83; SD age: 13.26), 9 people from the United Kingdom (3 females; mean age: 42.11; SD age: 14.06), and 14 people from the United States (10 females; mean age: 45.64; SD age: 16.23) were included for analysis, while 32 participants from 25 different countries were excluded. The scores for the six participating nationalities on Hofstede's dimensions are provided in Table 2.10. As the data was not normally distributed, we used non-parametric tests in all cases.

To determine whether the influence of a different reason for needing an extension created significant differences in user perceptions, we used the Wilcoxon Signed Rank test to compare the two new scenarios (*FemiAlt* student and *Mascu* professor; *FemiAlt* student and *Femi* professor) to the original scenarios with the *Femi* student (*Femi* student and *Mascu* professor; *Femi* student and *Femi* professor).

Table 2.9: The student's reason, the professor's response, and the scenario outcome for each of the six scenarios (the student gets no extension in the scenarios with a grey background).

Scenario			Reason for needing an extension	Response of professor	Does the student get an extension?
No.	Student	Professor			
1	Femi	Mascu	Family event	Needing an extension because of attending a family event is a weak excuse	No
2	Mascu	Mascu	Performance	Wanting to perform better is a good reason for needing an extension	Yes
3	Femi	Femi	Family event	Attending a family event is a good reason for needing an extension	Yes
4	Mascu	Femi	Performance	Professor doesn't understand, but will give an extension if it's important to the student	Yes
5	FemiAlt	Mascu	Computer breakdown	Needing an extension because of a computer breakdown is a weak excuse	No
6	FemiAlt	Femi	Computer breakdown	A computer breakdown is a good reason for needing an extension	Yes

Table 2.10: Number of participants from each country, and the scores for these countries on Hofstede's dimensions (G. Hofstede et al., 2010). Highest and lowest scores are underlined.

	N	PDI	IND	MAS	UAI	LTO	IvR
France	5	68	71	43	86	63	48
Germany	10	**35**	67	55	65	**83**	40
Russia	6	**93**	**39**	**36**	**95**	81	20
United Kingdom	9	**35**	89	**66**	**35**	51	**69**
USA	14	40	**91**	62	46	26	68
Egypt	5	80	38	53	-	**7**	**4**
Difference between lowest and highest		58	52	30	60	76	65

We only found significant differences for participants from the United Kingdom (Table 2.11) and Germany (Table 2.12). Participants from the United Kingdom found the student and the professor more appropriate in the scenario with the *FemiAlt* student and the *Femi* professor, than in the scenario with the *Femi* student and the *Femi* professor. Participants from Germany found the extension fairer to others with the *Femi* student and the *Mascu* professor. They found the *FemiAlt* student more appropriate than the *Femi* student in the scenarios with the *Femi* professor. They also thought the extension was fairer to other students with the *FemiAlt* student and *Femi* professor combination.

Table 2.11: Comparison of selected questions between the *Femi* student and the *FemiAlt* student for participants from the United Kingdom. Named scenario was rated significantly higher (the student gets no extension in the scenario with a grey background).

Scenarios to compare				Country for which the scenarios were compared	
Scenario A		Scenario B		United Kingdom	
Stud	Prof	Stud	Prof	Student appropriateness	Professor appropriateness
Femi	Mascu	FemiAlt	Mascu	-	-
Femi	Femi	FemiAlt	Femi	Scenario B p = 0.016	Scenario B p = 0.010

Table 2.12: Comparison of selected questions between the *Femi* student and the *FemiAlt* student for participants from Germany. Named scenario was rated significantly higher (the student gets no extension in the scenario with a grey background).

Scenarios to compare				Country for which the scenarios were compared	
Scenario A		Scenario B		Germany	
Stud	Prof	Stud	Prof	Student appropriateness	Extension fair to others
Femi	Mascu	FemiAlt	Mascu	-	Scenario A p = 0.039
Femi	Femi	FemiAlt	Femi	Scenario B p = 0.026	Scenario B p = 0.034

To determine whether the behaviour of the *Mascu* characters were considered more appropriate than the *FemiAlt* characters, we used the Wilcoxon Signed Rank Test to compare the new scenarios to the old scenarios (*FemiAlt* student and *Mascu* professor versus *Mascu* student and *Mascu* professor; *FemiAlt* student and *Femi* professor versus *Mascu* student and *Femi* professor).

We only found significant differences for participants from Egypt. They considered the appropriateness of the student significantly higher with the *FemiAlt* script ($Mdn = 6$), than with the *Mascu* script ($Mdn = 3$) $T = 0$, $p = 0.042$.

Looking at the participants' comments on the scenarios with the *FemiAlt* student gave additional insight into the participants' choices. Interestingly, four out of the five French participants stated explicitly in the scenario with the *FemiAlt* student and *Femi* professor that the professor should not have given an extension due to a computer break-down (e.g. "A good teacher cannot give an extension for no reason. Here the teacher cannot be certain of the reason the student gave"). Interestingly, the same four French participants gave a similar reasoning for the *Femi* student and *Femi* professor combination. In comparison, four out of six Russian participants, as well as four out of five Egyptian participants, argued that in this scenario the professor was correct in giving an extension.

Russian participants were quite consistent on their comments on the scenario with the *FemiAlt* student and the *Mascu* professor; four out of six participants stated that the professor should have given an extension (e.g. "He could understand everything and offer to redo the project", or "he would give her more time"). The same trend can be observed in the Egyptian data, where four out of five participants stated that the professor should have given the extension (e.g. "he would have extended the deadline as it is a technical problem, the student has no hand in it").

2.5.4 Discussion

We expected that participants from countries that score high on Masculinity would consider the behaviour of characters with the *Mascu* script more appropriate than characters with the *FemiAlt* script (Hypothesis 2.1).

We were unable to confirm this hypothesis. The qualitative data does show that Individualism versus Collectivism still plays a strong role (Egypt and Russia versus France).

We expected that the scenarios with the *FemiAlt* student would be perceived significantly different from the scenarios with the *Femi* student (Hypothesis 2.2).

We found that there is a significant difference in perception of appropriateness between participants from Germany and the United Kingdom. In particular, the participants from Germany found the *FemiAlt* student more appropriate than the *Femi* student when the student was interacting with the *Femi* professor. The participants from the United Kingdom found both the student and the professor more appropriate with the *FemiAlt* student and the *Femi* professor combination than the *Femi* student and *Femi* professor combination. These results suggest that the appropriateness of behaviour is not judged primarily based on the visible behaviour of the characters, but more on the user's interpretation of the character's motivation, notably the student's reason for needing an extension, and the professor decision whether or not to give an extension.

We are aware of the small sample size, in combination with the many judgements each participant had to do. However, our aim was not to do theory testing, but to explore the difference between the perception of users, and the intentions of designers.

2.6 Conclusion and Recommendations

In this article, we considered culture-related differences in behaviour to create four, and later six, different scenarios in which two virtual characters interact. The behaviour of these characters was intended to resemble prototypical behaviour from countries that score high or low on the cultural dimension of Masculinity (Hofstede, Hofstede & Minkov 2010). By showing these scenarios to participants of different nationalities, we investigated their perceptions.

Results from our first experiment indicate that participants did judge the behaviour in the scenarios to be significantly different from each other, but not as we expected. We found in the first experiment that participants from countries that score high on Individualism judged the behaviour of the characters significantly different from participants from countries that score high on Collectivism. In the second experiment, we introduced two more scenarios that are less likely to be influenced by the Individualism dimension. We found that participants from Masculine countries considered the characters in the new scenarios significantly more appropriate than the Feminine characters in some of the old scenarios.

The study allowed us to formulate recommendations for researchers that aim to design culture-specific behaviour for virtual characters. This was possible despite small sample sizes, because of the variety of countries and continents, and the answers to the open-ended questions. A larger scale user-test would be valuable but costly, and not necessarily more productive. Moreover, a new test is required for every modification, as experiments 1 and 2 have shown.

The recommendations are based on elements that appear in the 'Hidden user-context' (unintended by designer) and 'Unperceived by user' areas of Table 2.8. We consider it important to…

1. …test whether participants from different nationalities perceive the behaviour of virtual characters with different cultural scripts differently;
2. …test hypotheses with a wide variety of cultures represented, instead of a large number of participants from a limited variety of cultures;
3. …include open-ended questions in user tests to discover hidden-user-context issues that may not become apparent from closed-ended questions;
4. …test whether the intended appropriate culture-specific behaviour is actually considered to be appropriate by the target audience;
5. …test whether different elements of the content and context, even those inconspicuous to the designer's mind, affect the users' perception of the scenario as a whole.

Chapter 3

Creating a World for Socio-Cultural Agents

"Our lives aren't even about doing real things most of the time.
We think and talk about people we've never met,
pretend to visit places we've never actually been to,
discuss things that are just names
as though they were as real as rocks or animals or something.
[…] we're living in other people's minds."

Tad Williams

Abstract

Creating agents that are capable of emulating similar socio-cultural dynamics to those found in human interaction remains as one of the hardest challenges of artificial intelligence. This problem becomes particularly important when considering embodied agents that are meant to interact with humans in a believable and empathic manner. In this article, we introduce a conceptual model for socio-cultural agents, and, based on this model, we present a set of requirements for these agents to bet capable of showing appropriate socio-cultural behaviour. Our model differentiates between three levels of instantiation: the interaction level, consisting of elements that may change depending on the people involved, the group level, consisting of elements that may change depending on the group affiliation of the people involved, and the society level, consisting of elements that may change depending on the cultural script of the agents involved. As such, we are able to have culture alter agents' social relationships rather than directly determining actions, allowing virtual agents to act more appropriately in any social or cultural context.

3

3.1 Introduction

Horatio finds himself lost in an unknown city, looking for a place to sleep. Some people are about on the streets, in shops and cafés. What should he do?

Based on the information above, people would have almost no difficulty trying to describe what Horatio could do. This is because we are able to make assumptions about the social relationship between Horatio and the various kinds of people he might try to ask for help. While these assumptions are based on implicit expectations of the context Horatio is in, they do help to make predictions about how others would respond.

For an intelligent agent to be able to make the same assumptions and predictions, it needs operationalized parameters of the social world. What is the relationship between Horatio and people who pass him by on the street? Who would be willing to help him with his predicament? Without being able to discriminate between people, he would expect to be treated the same by every person.

Besides being able to make assumptions about the intentions of the characters, one also needs to consider the difference between 'right' and 'wrong'. Changing just a few elements in an interaction might easily change our perception of right and wrong; what if Horatio demanded of a stranger to take him to a hotel? Without being able to discriminate between actions, he would expect every action to be equally appropriate.

Modelling social behaviour is already quite challenging, as there are many ways in which our behaviour is influenced by our perceptions of the social world (as can be read in Brown's (2000) treatise on group dynamics). This modelling exercise becomes even more complicated when you start considering the effect of culture. What if ignoring a stranger is a normal thing to do in the country that Horatio is visiting. Including culture adds an extra level of complexity to the already quite challenging level of social behaviour.

The questions posed above require certain concepts to be present in the mind of an agent. Without them, Horatio has no way to determine what he should do in this foreign place. In this article, we aim to describe how these concepts should be incorporated in the design of a socio-cultural agent. We consider a socio-cultural agent to be one that is able to make assumptions about their social world, and is able to show believable culturally varying behaviour. Therefore, a socio-cultural agent needs a conceptual model of their social world. That model should be as simple as possible, while still being rich enough to allow for short emergent interactions between agents with different cultural configurations. The model presented here will be not be defined in a technical manner, and will still need to be instantiated for specific application domains.

The paper is organized in the following manner. We will start by describing related work on cultural agents. The next section will focus on the notion of rituals, a construct through which behaviour gains social meaning for a group of agents that have shared attention. After that, we focus on different interpretations of these actions by having different social components active in the mind of an agent based on the ritual. In the last part of the paper, we will look at how culture can modify these rituals and moral circles to create culturally varying behaviour in agents.

Throughout the article, the conceptual model and the concepts therein will be introduced from the perspective of Horatio, who is still in search of directions. He will meet another agent, the elderly Claudius whom he has not met previously, and will interact with him.

3.2 Related Work

The increasing need for embodied agents to interact in a social and empathic manner has led researchers to address different aspects of social interaction. Particularly related to the work presented in this paper is the Synthetic Group Dynamics (SGD) model, proposed by Prada and Paiva (2006), as it aims to create believable interactions in social groups formed by autonomous agents. In order to achieve this, agents build social relations of power and interpersonal attraction with each other. They also have the notion of belonging to a group in which they are regarded as more or less important, according to their status and/or level of expertise.

Similarly to the SGD model, our proposed model also places a strong emphasis on embedding group dynamics and social relationships in the agent's mind. Differently from SGD, we also address the relationship between culture and the dynamics of groups.

When designing social agents, culture has often been overlooked despite its huge influence on human behaviour (G. Hofstede et al., 2010). We argue that without considering culture, the social richness of agent-based simulations is significantly limited. For instance, it becomes difficult for agents to empathize with users from different cultures if they lack the ability to interpret actions from different cultural perspectives. Moreover, modelling culture has been an essential endeavour when considering agent-based applications for intercultural training such as ORIENT (Aylett et al., 2009), ELECT BiLAT (Hill et al., 2006), or TLCTS (Johnson, Vilhjalmsson, & Marsella, 2005).

Research on cultural agents is steadily rising. So far, several systems have focused on the adaptation of directly observable features of conversational behaviour to specific cultures. For instance, the work of Jan et al. (2007) addresses differences in proxemics, gaze and speech overlap between the North American, Mexican and Arabic cultures. Similarly, the work of Endrass et al. (2011) addresses the integration of non-verbal behaviour and communication management aspects, considering differences between the German and Japanese cultures.

While the aforementioned models focus on modelling the effects of culture on communication aspects, the research presented in this paper addresses another important facet of culture, namely, how it influences decision-making and behaviour selection.

In the model proposed in Mascarenhas et al. (2009), two of Hofstede's dimensions of culture, individualism and power distance, are directly used to influence the agent's decision-making and appraisal processes. This is done only at the individual level without considering important elements from the social context such as an ongoing ritual, group membership and other relational variables. As a result, the agents seem, to the human observer, to be obsessed with their own goals, and to lack social awareness.

Another agent model where culture affects decision-making is the model proposed by Solomon et al. (2009), which concerns the definition of specific cultural norms. The model allows defining links between specific actions (e.g. show-picture-of-wife) and one or more cultural norms (e.g. respectful-of-modesty). An association link can either be positive in the case where the action promotes the norm or negative in the opposite case. One drawback of this model is that it requires a great deal of manual configuration as it tries to associate culture directly to individual actions.

One step towards generating culturally appropriate behaviour within an agent model was taken by Mc Breen et al. (2011) who propose the concept of cultural meta-norms to operationalize culture. These meta-norms use Hofstede's dimensions of unconscious cultural values to explain how you can create a set of generic rules that give agents a propensity to behave in a certain way in certain relational contexts.

In our proposed model, we follow previous work (Mascarenhas et al., 2010) in arguing that actions are often selected not because of their instrumental effects, but because they are an important symbolic step of an ongoing ritual, thus making rituals an essential part of social interaction.

The idea that rituals are important to model cultural differences in embodied agents was also explored in Mascarenhas et al. (2010), where a computational model of rituals was implemented and integrated into an affective agent architecture, developed by Dias and Paiva (2005). One limitation of the model proposed by Mascarenhas et al. is that it assumes that agents have a shared knowledge of rituals, which is not true when considering scenarios where agents from different cultures may meet, as exemplified in this paper.

3.3 Modelling Socio-Cultural Agents

To start discussing the conceptual model for socio-cultural agents, it is necessary to specify in overview the simulated social world in which our agents live. In Figure 3.1, we have identified three different levels of instantiation. They range from the more specified (interaction) to the more abstract (culture):

- The 'interaction' level is comprised mostly of elements that are visible to outsiders, and that may change depending on the people involved;
- The 'group' level is comprised mostly of elements that are not necessarily visible to outsiders, and that may change depending on the group affiliation of the people involved;
- The 'society' level is comprised mostly of elements that are invisible to outsiders, and that may change depending on the cultural script of the agents involved.

In the coming sections, we will discuss each of these three levels in detail, and explain how they relate to each other. Through these explanations, we will specifically name requirements that are necessary to create believable socio-cultural agents.

Figure 3.1: From culture to rituals: a conceptual model for socio-cultural agents.

3.3.1 'Interaction' Level

… After walking around for a while, Horatio is unsure in which direction to continue and decides that it would be best to ask somebody on the street for more information. At that moment, Claudius, who is on his way to work, is walking in the opposite direction of Horatio. Horatio decides to draw the attention of Claudius…

Some actions may be purely instrumental, e.g. picking up an object that has fallen to the floor. However, in a social world, such actions usually have a symbolic effect as well. For instance, what objects would you pick off the floor, in which places, and with which people present? It is important to be able to understand the social consequences of actions.

These symbolic actions may have some effect on the relationship between yourself and others. However, such an effect only occurs if the other is paying attention; if not, the social meaning of the action might be lost on her.

This process of exchanging symbolic actions can be seen as a ritual, as defined by Rothenbuhler (2009). He states that rituals range from the ceremonial and memorable to the mundane and transient. In fact, any group of people that has a degree of shared attention can be said to be engaged in a ritual. This is reinforced by Bell (1997), who claims that rituals are a way through which people can act in the world. We call those people that are part of a ritual its participants and its location the physical context. In our story, the participants would be Claudius and Horatio, and the physical context would be the street.

There are two sides to a ritual, a visible side, i.e. the behaviours of individuals that can be seen by outsiders, and a non-visible side, i.e. the symbolic function of the actions as they are being interpreted by participants. This symbolic function is impossible to separate from how a community conceives the world (Bell, 1997).

Rituals help mediate changes in social order, and are thus an essential element of social behaviour. As Hofstede et al. (2010) say in their work, rituals are "Collective activities that are technically superfluous to reach desired ends but that, within a culture, are considered socially essential".

… In Horatio's mind, there is a certain structure to asking a favour of a stranger. First, you would politely greet him or her, and after enquiring whether they know the place, and exchanging pleasantries, you would then proceed to ask the other for help. Doing so would make the stranger feel obliged to help you…

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In a further operationalization of the ritual, Hofstede (G. J. Hofstede, Mascarenhas, & Paiva, 2011) explains that a ritual consists of three elements: a beginning, the body, and an end.

The beginning is characterized by an initiating move and a response. This initiating response carries the social meaning of the ritual. The response can be classified as running along two dimensions: direction (going along or opposing), and strength of the response (ranging from low to high). Depending on the response, a ritual is either initiated or aborted; if the purpose of the ritual is clear to both parties and agreed upon, they proceed to the body of the ritual.

Within the body of the ritual, the actual social change is put into action. For the ritual to be effective, the participants of the ritual must act in an appropriate manner.

The last stage of the ritual would be the end, in which the social change is reinforced in an appropriate manner and the ritual is brought to its conclusion. This will free the agent's attention for other activities.

The first two requirements for socio-cultural agents are:

1. They need to be aware of their context, and whether they are taking part in a ritual with other participants;
2. They must be able to decode the symbolic function of a perceived ritual;

On his way to work, Claudius sees a stranger walk up to him with an uncertain look on his face. This kind of behaviour is typical of people who need directions, and need somebody to help them on their way…

A ritual can help to decode the social meaning of certain actions. For example, in the USA, when a long-time boyfriend drops down on one knee in front of his girlfriend, few compatriots would not understand the social meaning of the action.

Not all behaviour will be interpreted in the same manner; the same ritual might mean something different depending on the physical context and the participants. This issue is particularly true when the participants are from different cultures, but even within the same culture, there is no guarantee that you 'speak' the same language. The meaning of a ritual may even change over time (Bell, 1997).

In the example above, Claudius recognizes that when Horatio walks up to him in a certain way, it means that he needs some help. What if somebody did that at night in a shady part of town? What if Horatio and Claudius had been old friends? Would Horatio still have walked up to Claudius in the same manner, and if so, would it have meant the same thing?

The third requirement for socio-cultural agents is:

3. The symbolic function of a ritual needs to be able to change depending on the people involved (participants) and the environment (context);

3.3.2 'Group' Level

Tajfel and Turner (1986) posit that there is a difference between interpersonal situations, in which behaviour is primarily influenced by psychological variables, and group situations, in which behaviour is primarily influenced by category-based processes. As such, on a group level, it becomes important to take into account more elements than just those present in the interaction. Behaviour may be influenced by people who are not present ('would your parents approve of your behaviour?'), and previous interactions may have an impact on your current behaviour. On this level, we discriminate between three different elements: moral circles, relational variables, and social norms.

Moral circles

In the past section, we talked about the concept of 'social order'. By this, we mean that there may be pre-existing social relations between the participants of a ritual. Sometimes there may be a connection between individuals, without having previously met, such as while watching a football match together with other spectators. These relations might not always be visible to all during an interaction between agents; they may only exist in the minds of the individual. To describe these relations, we use the concept of moral circles. A moral circle can be considered "the boundary drawn around those entities in the world deemed worthy of moral consideration" (Laham, 2009). This concept is similar to what

Singer (2011) alludes to in his work on the evolution of moral progress and ethics: a large part of social interaction is influenced by whom we let into our moral circle. Only then can we build meaningful relationships.

In our work, we formalize a moral circle to consist of three elements: the people to whom it applies, their mutual perceptions of social attributes (or relational primitives), and the social norms that regulate their behaviour. Both relational primitives and social norms are discussed in the following sections.

In Kemper's status-power theory (2011) moral circles are called reference groups. These reference groups are always present in the mind of an individual in the form of the 'reference group committee' that helps the individual make decisions.

Why use the concept of a moral circle? To begin with, it is generic. Hofstede et al. (2010) use it as a general indication of a human unit of social agency, ranging from a few people to all of humanity, taking inspiration from evolutionary biologist David Sloan Wilson (2007), who describes humans as a 'eusocial' species, i.e. one in which the group has supplanted the individual as the main level of evolution.

Now, while in most eusocial species it is rather simple to determine the unit of evolution – it would be the colony of bees, for instance – this is not so in humans. Yet the assumption is that we have a biological propensity, including moral sentiments, to act as group members. In other words, acting for the survival and prosperity of our moral circles is in our nature. It is this propensity that is the main justification for our concept of moral circle – which we shall often abbreviate 'MC' from this point onwards.

The concept of a moral circle leads to our forth requirement:

4. Each agent must categorize each individual into moral circles;

… Claudius wonders if he has time to help this stranger. He has an important deadline at work today, and he still has some things left to prepare. Therefore, he is left with a choice: he can either stop for a few seconds and talk to the stranger or he can choose to ignore the stranger and carry on to work…

Each context shapes its own MC typology, which depends on who is involved and what MCs they perceive to be relevant to the situation. A person can belong to many different MCs at the same time. It is thus that several MCs can affect the actions of any one person at any time, but one MC is usually more salient than others are. For instance, in most cultures, leaving work duties to marry or bury a family member would be allowable, or even endorsed. The priority between events is itself symbolic of a prioritisation among MCs.

MCs come in different types. They can range from the default MC of 'all people who count as people', to which strangers may or may not belong, to long-lasting organised groups, such as families or ethnic communities or companies, to the relatively informal, such as groups of acquaintances, or even two people meeting in the street by chance.

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A more formal MC has both more specific social norms, i.e. rules of appropriate behaviour, and a strong inertia in membership; whether you are in or out is usually determined by clear attributes e.g. employment or club membership. Membership changes in more formal MCs are usually mediated by formal rituals, often denoting a change in status.

MCs that are more informal can be, for example, groups of specific friends (some you might know from your studies, others from your sports club). These more informal MCs still develop guides to appropriate behaviour. Membership of such an informal MC is often not as clearly defined as in more formal MCs. The relevant social norms for an informal MC will not be stated in any text, and can evolve more freely through an emergent consensual process, than is usual in formal MCs.

A particularly difficult social issue is how to behave when more than one MC could be relevant. For example, this would be the case when you fall in love with a colleague from work, or have to operate on a family member. Thus, context codetermines which MC prevails.

One will treat close friends and family differently from strangers. Sometimes you might give them a preferential treatment, while other times you might judge them more harshly than you would others. In other words, each MC has its own centrality; this is defined as Moral Circle Centrality (MCC).

MCC deals with 'those who matter to me' and defines the position of that MC within the entire set of MCs. The most central MCs include groups such as your family or close friends. Less central groups are those groups including strangers and acquaintances. Since each MC only exists in the mind of an individual, perceptions might differ across people. You might consider somebody a part of a 'close friend' MC, but he or she might not consider you part of his or her MC.

Based on our examples above, MCC is probably best represented on a sliding scale. As a first step though, we can identify a limited set of categories, e.g. 'in-group' and 'out-group', or 'stranger', acquaintance', and 'family member'.

The fifth requirement:

5. Socio-cultural agents need to be able to differentiate between types of moral circles; the moral circle with the highest centrality should receive priority when multiple moral circles are salient;

Relational primitives

Relational primitives are social variables that exist within the mind of the individual and describe the relational properties of other individuals. In our work, we differentiate between two relational primitives: status and reputation. More can be identified, such as the power dimension identified in Kemper's work (2011); depending on the instantiation in specific applications, additional primitives may need to be defined.

Status

> *… Horatio walks up to Claudius and recognizes that he is dealing with an older man who is wearing a very formal suit. The old man is looking at his watch and Horatio realizes that the older man is probably in a hurry…*

Many difficulties between individuals arise because there are differences in perceived status ("You're not in charge, I am!"). To avoid such conflicts, formal MCs usually have formal roles with explicit rights and obligations, which can range from that of a managing director of a multinational company to a junior trainee. In our model, we have instantiated this concept as moral circle status (MCS).

In the example above, Horatio is able to make an assumption about the status of Claudius because of two factors: his age, and the suit he is wearing. Note that Horatio might be wrong in his appreciation of these attributes; these symbols might mean something different to Claudius than they do to Horatio.

The sixth requirement:

6. Agents must be able to infer the status of characters, either through public variables, the observation and interpretation of symbols or through information gained from previous interactions;

Reputation

> *… Claudius has also had bad experiences with strangers in the past. Once, while he was helping a stranger, that stranger actually took his wallet...*

Previous interactions with people will influence the way you treat them at a later stage; you will treat a 'good' friend differently from a 'bad' friend. In our model, we have instantiated this as moral circle reputation (MCR).

Reputation can be seen as a social 'standing': an agent could be 'in good standing' versus 'in bad standing' with its fellows (Nowak & Sigmund, 2005). Reputation is essential for agents that interact with each other multiple times; it is likely that they will act differently depending on how previous interactions with that agent have played out.

Each MC has certain rights and obligations conferred on its members, depending on their roles in the MC. MCR can thus be used as a measure of how well a person lives up to their MC derived obligations and their respect for the rights of other MC members; whether a MC member follows or deviates from the norm will have an effect on their MCR.

Each member of the MC has a perception of the MCR of other known members and of his or her own. Therefore, you might think less of yourself if you have done something wrong, and others might think less of you. This action can then be sanctioned by another member of the MC, and, depending on the level of MCR change, be attenuated by an appropriate atonement. Not wanting to lose reputation can be an important reason for an

agent to respect a norm (Axelrod, 1986).

Two important elements need to be present within our model: actions have to be judged as to whether they deviate or follow the norm, and members of the moral circle need a perceived level of reputation (with unknown people these will be based on cultural meta-norms, see section 3.3.3).

This leads to the seventh requirement:

7. Appropriate or inappropriate behaviour of other agents should lead to a respective change in Moral Circle Reputation;

Social Norms

… Claudius has no idea where the hotel is that Horatio is looking for. In his eyes, a young person like Horatio was probably not well prepared in planning his trip and it is his own fault. Claudius tells the man that he has no idea where the hotel is, wishes him good luck, says he has to go, and rushes to work…

Social norms help to identify how one should behave in a ritual. These norms reflect underlying value structures, but they are not fully determined by them. They evolve in path-dependent ways, depending on contextual contingencies, to be accepted by a society as a short-term guide to appropriate behaviour. Parts of society may evolve their own social norms, and as such, social norms are present on a group level. Therborn (2002) makes the case for the importance of normative questions to the discipline of sociology.

As stated by Hollander and Wu (2011) in their review of norms in agent-based simulations: "The literature is populated with numerous definitions and uses of the term norm". However, norms are widely understood as rules that specify which behaviours are to be displayed, allowed, or prohibited when in a given context. This is how we conceive of them in this article.

Let us define more precisely how social norms are related to moral circles and the relational primitives (in this case, status MCS and reputation MCR). Operationally, each moral circle can have its own social norms, for example a company, a club or a family. As such, there are often multiple moral circles active at the same time (sometimes without a member even being present; 'what would your mother think of your behaviour'). Knowing the most salient MC in any context indicates to an agent which set of social norms take precedence.

Both the interpretation of the appropriateness of behaviour and the translation of intentions into actions, are mediated by the current social norms. These social norms are the most malleable part of MC rules. A population can come to believe that drunk driving or smoking indoors in the presence of non-smokers is normatively wrong, in a relatively short period. People actually use norm-related behaviours (adherence, violation, attempts to change) as a means of maintaining or changing the MC. However, the underlying cultural meta-norm structure and MC dynamics will not have altered significantly, if at all.

The detailed functioning of MCs in practice reflects the underlying cultural values.

Let us examine how MCS and MCR within a MC could affect which social norms apply. Some social norms will define how to behave towards those of differing status. Here MCS within a MC determines which norms are applicable. For example, should greater respect be shown to high status family members or colleagues, and if so how? If more than one MC is active, the centrality of these MCs and the status and reputation of the individuals present help to establish the most salient MC (and which social norms take precedence).

In our example, Claudius believes that Horatio should have been more prepared. As a result, Claudius believes that it is more important for him to carry on to work than to help this undeserving youth.

This is the eighth requirement:

8. Socio-cultural agents should determine which social norms are applicable and when multiple are applicable at the same time, which take precedence. This process should be dependent on the salient moral circles, and the relational primitives of the participants;

3.3.3 'Society' Level

In their work, Mc Breen et al. (2011) defined the notion of a *cultural meta-norm*. A cultural meta-norm has as its pre-conditions 1) the culture of agents in a situation, 2) a relational setting between agents. The culture acts as a perception and interpretation filter on the relational setting. The post-condition of a meta-norm is a tendency to create, strengthen, or weaken a relational goal.

This is the reason for the epithet 'meta-', since a norm has specific behaviour as its post-condition. In the case of a cultural meta-norm, the relational goal change might not lead to any behaviour. For instance, depending on the specifics of the situation, the agent might not be empowered to act. Typically, a simulation would take the relational goal change into account alongside specific context factors, such as instrumental goals, to determine the actual behaviour of the agents.

Cultural meta-norms

…Horatio is left feeling bad and confused: where he is from, you usually help strangers, even if you are in a hurry. He decides to carry on, and continues on his journey.

Cultural meta-norms as defined by Mc Breen et al. (2011) model agents' propensity to behave in a certain way in certain relational contexts, such as 'meeting a stranger' or 'meeting a person in need' or 'dealing with older people'. In contrast to social norms (middle level of Figure 3.1), cultural meta-norms are non-instantiated guides to social behaviour (upper level in Figure 3.1). They are about the relational fundamentals of social life, and they are shared within any society that has the same culture. They deal with the basic

question of how people should behave with respect to each other depending on who they are. They are close to the values of a culture, in the Hofstede sense of 'cultural programming of the mind', shared tendencies to perceive the social world, and act in it, in certain ways.

In our example, Horatio has a different cultural meta-norm regarding helping a younger stranger in need, than Claudius; Horatio expects Claudius to have a relational goal of providing help, while Claudius has no such goal, as a stranger receives less MCS and MCR in his culture. For Horatio is it unthinkable that you would leave a stranger needing help on the street to go to work. Thus, cultural meta-norms model how culture influences the behaviour of agents.

Within our conceptual model, culture will influence the social structure of MCs, and their social norms. The culturally modifiable parameters are the weight of the relational primitives, the salience of MCs, and the salience of social norms. The most salient MC and the most salient social norms can be established using this operationalization of meta-norms, e.g. "the work MC prevails over others" – perhaps qualified by the time of the week, or "what a senior person (could be parent, teacher, priest, boss…) wants of me is more important than what anybody else wants of me". There should be room to add culture as a weighting and salience mechanism for MCs and social norms.

Every culture, through the different modifications it brings to the content and salience of MCs and social norms, will cause agents to behave differently, and to judge the behaviour of others differently as well.

The final requirement is thus:

9. Cultural Meta-Norms should be used to create weighting and salience mechanisms for moral circles, social norms, and relational primitives.

How can we begin to represent these varying behaviours and judgements in agent architectures? We propose to do this using Hofstede's dimensional model of culture (G. Hofstede et al., 2010).

Operationalizing culture

We give an example of modifying the behaviour of agents based on their cultural script by linking elements of our conceptual model to Hofstede's dimensions of culture.

Hierarchy: large power distance versus small power distance

The importance given by agents to status depends on the dimension of power distance. This dimension represents the extent to which the less powerful members of a society expect and accept that power and rights are distributed unequally. Large power distance splits up the society into MCs of people with equal status that are not permeable, and depend on position in society. Agents in cultures of large power distance will respond differently to others depending on how they perceive their MCS relative to their own. Status differences will be effective barriers to communication, and particularly to volitional

behaviour travelling upwards.

Horatio would feel that the behaviour of Claudius was appropriate if he was from a culture of large power distance. Indeed, if he were from a culture of very large power distance culture he would never have approached Claudius in the first place.

Aggression and gender: masculinity versus femininity

The importance given to reputation depends on the cultural dimension of masculinity. This dimension is about assertive dominance and emotional gender roles. It contrasts a strong-handed, competitive orientation in 'masculine' cultures, in which people in general do not assume others to be trustworthy, men are supposed to be tough and women subservient and tender, versus a consensus-seeking and care-taking orientation for both women and men in 'feminine' cultures. For our relational primitives in masculine cultures, MCR will be very unequally divided across the MC, with a tendency to blame the weak and admire the strong. MCR will be more evenly distributed in feminine cultures, and will not change so radically with poor behaviour.

In our example, if both are from a masculine culture, Horatio would tend to judge Claudius harshly for not helping him, just as Claudius would be likely to judge Horatio harshly for being ill-prepared. In a feminine culture, both would be more forgiving of the apparent faults of the other, and would expect this same forgiveness of others for their own mistakes; and Claudius would be more likely to actually help Horatio.

Identity: individualism versus collectivism

The importance given to MC centrality depends on the cultural dimension of individualism. An individualistic culture is one in which its members are supposed to be independent, self-motivated individuals. Its opposite, a collectivistic culture, is one in which everyone feels interdependent, and people act based on the social norms that come with their specific role in society.

In our example, Claudius did not consider helping Horatio because he was a stranger. This is more likely in a collectivist culture, as out-group members are considered less 'my business' than in-group members are. In an individualistic culture, helping Horatio would have been more likely, as the divide between in- and out-group members is less great than in collectivistic cultures. On the other hand, if a collectivistic Claudius decided to 'adopt' a stranger, he would probably go to greater lengths in helping him.

3.4 Discussion

3.4.1 Design Choices

Our design principles were threefold:

- Re-use simple, broad-range theory from the social sciences;
- Re-use good properties of existing agent models;
- Be unconcerned with implementation architecture.

It is our conviction that social sciences have theories on offer that have not yet been used in socio-cultural agents, simply because of a combination of the field's youth, the lack of contact between islands in the 'ivory archipelago' of social science, and the absence of systematic attempts to find such theories.

Theories that could be used are those that are parsimonious, so that they will not tend to create explosive complexity of agent models, and that have proven to be valid across a wide range of circumstances. Theories at different levels of abstraction could be eligible: the individual, the dyad, the group, or the society.

In this model, we have concentrated on three theories. The first is the work of Kemper (2011) that models how individuals deal with status and power in their moral circles –which he calls reference groups. The second is the work of Rothenbuhler (1998) on rituals in groups, in which he generalizes the notion of ritual to include all social interaction in which a group of people have shared attention. There is also a clear conceptual link with Kemper: rituals serve to maintain moral circles, or if they are big rituals, to modify status hierarchies and membership in those moral circles. The third major theory is Hofstede's model of national culture (G. Hofstede et al., 2010), that can explain why similar dynamics, with slightly different parameterizations, lead to such stable differences across national patterns in social reality.

To our knowledge, outside of our work, Kemper and Rothenbuhler have not been used in agent architectures before, although some work (Mascarenhas et al., 2009) discusses rituals in agent architectures. Hofstede's dimensions have been used in virtual agents before (Mascarenhas et al., 2009, 2010). Those attempts showed that culture was not very successful as a direct driver of behaviour; more basic social behaviour was found to be needed for culture to build on. This prompted the search for new theory that led to incorporating Kemper's status-power theory and reference groups.

3.4.2 Simplified Version

Our design choices imply that we do not believe a simplified version of the model could still plausibly produce equivalent behaviour. In fact, we rather expect the opposite: user testing will quickly show model elements that are too simplistic to capture social reality.

Directly instantiating goals for virtual agents based on culture, without what social

psychologists would call group dynamics, proved unsatisfactory, as argued above. Excluding culture would preclude making cross-cultural encounters virtual, and is therefore not desirable.

Figure 3.1 does show a way to simplify our model, though. The bottom layer concepts could largely be left out if the agents were non-embodied. There would still be a simulated process of course, implied by the box 'ritual'. However, there would not be any physical context. That also removes the need for model properties that come with embodiment of agents: visible age, gender, status-carrying attributes, non-verbal behaviour, and personality.

Actually, simulations have been carried out on this principle. In applications of trade negotiation (G. J. Hofstede, Jonker, & Verwaart, 2012) and consumer behaviour in car choice (Roozmand et al., 2011), culture as operationalized by Hofstede's dimension scores was used to modify agent behaviour in agent-based models. In the case of trade negotiations, face validity was achieved, and in the case of car selection, the model reproduced cross-national purchase patterns.

Another way to simplify the model, admittedly reducing its allure, would be to limit the number of cultures, or the number of moral circles. For purposes of testing and sensitivity analysis, such steps could certainly be taken.

3.4.3 Validation Scheme

There are two components to the validation of the model described in this article. The first is the validation of social norms and cultural meta-norms. This can be done using simulations with instantiated agent behaviour based on the model presented here. These rules of behaviour need to be validated by running simulations with a large number of participants from different cultures, to ensure that the behaviour described in these norms is actually representative of realistic differences in behaviour across cultures and groups.

The second is the validation of the model itself. This is a more difficult process. The evaluation of designed scenarios would just test the instantiation of the model, not the model itself. However, through a design-based approach, the model could be tested for its generalizability against a corpus of real-world stories: 'Can you describe every situation in terms of the elements of the model'. This helps to establish the boundaries of the model. There will be obvious boundaries to the model in terms of instantiated virtual worlds available. In future work we aim to instantiate this work for specific application domains and existing agent-based architectures. This will help us to identify if additional elements are needed.

3

3.5 Conclusion

The series of requirements that we have presented during the interaction between Horatio and Claudius represent elements that are important to consider when designing socio-cultural virtual agents. Taking these requirements as a starting point, we have discussed elements of our model that will help show realistic social behaviour that can be modified by culture.

Through rituals, in which a set of agents have shared attention in a certain environment, agents are able to act appropriately by applying the relevant moral circles and their social norms. This selection mechanism allows for different interpretations in different contexts.

Culture can then be applied using cultural meta-norms, which, in turn, affect the weighting and salience of the other model components. This allows us to have culture influence social relationships rather than act directly on behaviour. In addition, in the absence of familiar moral circles, cultural meta-norms can provide guidance. This is particularly important when meeting with strangers (from different cultures).

We believe that this paper makes some necessary conceptual steps to make virtual agents act more appropriately in any social or cultural context. Agents created with such a model can be used within (existing) agent architectures. Besides their practical use, they can also be used as tools to better understand how people perceive and interact with characters from different cultures.

In future and on-going work, we aim to put the concepts presented in this paper into existing agent architectures to create believable culturally varying behaviour in agents for educational purposes. The translation of the concepts will allow us to discover flaws and additional modelling requirements for socio-cultural agents.

Chapter 4

Modelling Culture
in Virtual Agents

*"Maybe the only significant difference between
a really smart simulation and a human being,
was the noise they made
when you punched them."*

Terry Pratchett

Abstract

This work addresses the difficulty of creating virtual agents that are capable of showing appropriate culturally varying behaviour when interacting with other agents or humans. Culture does not directly influence behaviour; it primarily influences how people perceive the social world. To create a socio-cultural agent, it is thus important to ensure that agents are aware of certain social elements, such as pre-existing relationships. We addressed this necessity by integrating culture into a model for social behaviour that can be used for virtual intelligent agents, and, through this model, operationalised one dimension of culture, individualism versus collectivism, in an intercultural training tool. In a cross-cultural evaluation, we compared how users from a collectivistic country (e.g. Portugal) and an individualistic country (e.g. Netherlands) perceived the behaviour of both individualistic and collectivistic agents. The results from our evaluation suggest that our model can be used to create culturally varying behaviour based on the individualism versus collectivism dimension. Future work will focus on applying the model to a wider range of cultural settings and applications.

4

4.1 Introduction

Imagine that we would not need to head to another country to become more experienced at interacting with people from other cultures. Using virtual agents, embodying cultural differences, we could create a system that could be accessed wherever and whenever, that can be used to train intercultural skills.

Such a system would require us to understand how culture specifically influences our behaviour, and how we could integrate that influence into existing agent-based models. The difficulty with integrating culture into intelligent agent models is that it is difficult to apply theories from sociology and psychology to actual agent decision making. These theories are usually quite vague in terms of exact behavioural tendencies, and not defined in a formal manner.

The aim of this paper is twofold. Firstly, we aim to establish how we can integrate culture into the interpretation and behaviour models of virtual intelligent agents. Secondly, we will look at the operationalization of one dimension of culture, individualism versus collectivism, using our models, in a specific application, Traveller. While there are multiple dimensions of culture, we only focus on one as a first step. This will allow future researchers to better understand the process of integrating culture into agent-based systems.

In the following section, we will discuss the theoretical background of this work. Then, in section 4.3, we will discuss existing work on modelling cultural factors in the behaviour of virtual intelligent agents. Afterwards, in section 4.4, the theoretical concepts that are needed to model socio-cultural behaviour will be introduced. In section 4.5, we will discuss our proposed agent model of social interaction followed by a description of how the model can be extended to model cultural differences in section 4.6. In section 4.7, our case study is presented and in section 4.8, we discuss its evaluation and the results obtained. Finally, we draw some conclusions and discuss future work.

4.2 Background

There are many definitions of culture, and they may range from more visible elements, such as the music styles of a group of people (or 'pop-culture'), to more non-visible elements, such as behavioural tendencies when in a group of people. Some researchers take a more blended view, such as Stella-Ting Toomey's conceptualisation of culture: "Culture is like an iceberg: the deeper layers (e.g. traditions, beliefs, values) are hidden from our view; we only see and hear the uppermost layer of cultural artefacts (e.g. fashion, trends, pop music) and of verbal and non-verbal symbols" (Ting-Toomey, 1999). She then explains that to truly understand the nature of a culture, we must be able to match the up-

per layers with the lower layers.

This is something that is also mentioned by Hofstede et al. (2010) when they discuss different manifestations of cultures; values are manifestations of the deeper layers of culture, and practices are manifestations of the upper layers of cultures. In their work, based on empirical data, they have attempted to describe these values (G. Hofstede et al., 2010), and how visible behaviour reflects these values (G. J. Hofstede et al., 2002). In this work, we will use both elements to create agents that can show appropriate culturally varying behaviour.

Hofstede et al. (2010) conceptualize culture as a limited number of major societal issues, to each of which a society finds a shared solution. These issues are conceptualised as continua; scales with a lower and an upper end. Hofstede et al. call these 'dimensions of values' and they describe how they vary across nationalities. Hofstede's model is based on questions about everyday work practices; the dimensions of values were a serendipitous finding. They refer not to convictions or beliefs, but to broad tendencies to perceive the social world in a certain way. The model has grown over time, as more sources of data were consulted. The latest model consists of six dimensions: (1) Individualism versus Collectivism; (2) Power Distance (3); Masculinity versus Femininity (4); Uncertainty Avoidance (5); Long-Term versus Short-Term Orientation; (6) Indulgence versus Restraint. Each of them is modelled as a continuum running along a scale from 0 to 100.

Note that the dimensions are not personality traits, but societal patterns. This means that, unlike personality traits, they will be shared by people from the same culture. Yet culture, as an unconscious set of basic values, should not be confused with conscious group affiliation. An example of this can be found in multicultural groups, in which visible group membership is shared but non-visible cultural values are not.

Do note that the picture drawn is necessarily simplified. The authors mainly provide descriptions for the extremes of the dimensions, and, as such, they are only abstract representations of how cultures can differ. In reality, almost all real world cultures have intermediate positions on the dimensions, and thus all cultures will share characteristics of both extremes. Furthermore, the dimensions of culture can only be isolated from one another in an artificial way; the six dimensions are abstractions that capture behavioural trends across cultures.

The dimensions of culture are one way of making a tangible abstraction of real world cultures. An attempt has been made to further instantiate these dimensions, through so-called synthetic cultures (G. J. Hofstede & Pedersen, 1999). These synthetic cultures have already been used in several simulation games (G. J. Hofstede et al., 2002), and represent extreme manifestations of the value orientations at the ends of the dimensions of culture. They are simplifications to the extent that they represent only a single aspect of social behaviour; they are not meant to describe the interdependency between dimensions of culture.

The advantage of these synthetic cultures is that they are among the very few scripts for cross-cultural simulations available that are based on theory. Harry Triandis, writes in his foreword to Hofstede's book: "In fact it has been shown (Bhawuk, 1998) that theory-based cross-cultural training is more effective than training that consists of scattered samples of beliefs, attitudes, and experiences. Why? It is easier for the learner to absorb the material and generalise to new situations if the training is based on theory".

The synthetic cultures are instantiated on different levels of human behaviour. They describe very general tendencies, but also specific actions. In the book by Hofstede et al., they describe certain elements: core values, core distinctions, seven key elements, words with a positive and a negative connotation. To provide an example, the individualism dimension deals with the extent to which members of a society feel responsible for themselves, or for the larger group they belong to. In individualistic cultures, ties between individuals are loose and rights and obligations should be the same for all people, whereas in collectivistic cultures, people are integrated into strong, cohesive groups and the boundary of the in-group is a moral boundary beyond which the same rights and obligations do not hold.

4.3 Related Work

Because culture can manifest itself in many different aspects of human behaviour, researchers have developed different kinds of models for creating culturally adaptive agents. Some models focus exclusively on addressing cultural differences in the external aspects of an agent's behaviour that are closely tied to its embodiment. For instance, in work by Jan et al. (2007), a model that addresses cultural differences in proxemics, gaze and turn taking was proposed.

In the same line of research, the model proposed in work by Endrass et al. (2011) addresses the cultural adaptation of gesture expressivity, usage of pauses, speech overlap and body posture. In contrast, other models, including the one proposed in this paper, are primarily concerned with how culture affects the processes of human cognition, including perception, interpretation, and decision-making.

The creation of these models is challenging because culture is essentially a social phenomenon that is associated to the shared knowledge of a societal group, which includes assumptions of what is right and wrong, and what is appropriate and inappropriate. Such assumptions have a major impact on human reasoning and behaviour, alongside individual goals and preferences. However, careful consideration of these shared assumptions has been, for the most part, absent from well-known cognitive systems, such as the SOAR agent architecture (Laird, 2012).

Still, some researchers in this field have begun to address cultural and social aspects in their work. For instance, the CAB model (Bulitko, Solomon, Gratch, & Lent, 2008) allows for the explicit encoding of specific cultural norms and stereotypes in a task-oriented

model. Furthermore, Thespian (Si, Marsella, & Pynadath, 2006) an agent architecture based on the PsychSim framework (Marsella, Pynadath, & Read, 2004), focuses on representing social obligations during conversations.

The models proposed in work by Mascarenhas et al. (2010) and in work by Nouri and Traum (2011) have established a direct cultural influence in the utility function that is used in the agent's decision-making process. This influence is also based on the cultural dimensions proposed in work by Hofstede et al. (2010). DIn contrast to the aforementioned systems, the model we are proposing focuses primarily on representing the existing links between culture and the way we perceive and treat others from a relational perspective.

4.4 A Conceptual Model for Socio-Cultural Agents

As mentioned before, culture can be conceptualised as a limited number of major societal issues. As such, culture does not directly influence behaviour, but it primarily influences how people perceive the social world. To create a socio-cultural agent, it is thus important to ensure that agents are aware of certain social elements, such as pre-existing relationships. For instance, consider the inherent difference between a family member and a stranger; people from different cultures will regard a stranger differently.

In previous work, we identified three different levels of instantiation that are important to consider when creating socio-cultural agents (Degens et al., 2012). They range from the more specified, the interaction, to the more abstract, the society (see Figure 4.1):
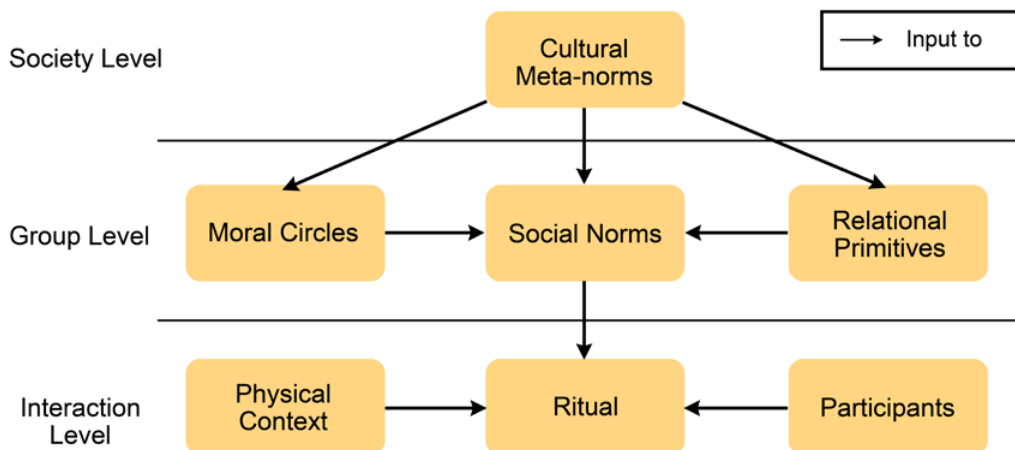
4

Figure 4.1: From culture to rituals: : a conceptual model for socio-cultural agents.

- The 'interaction' level is comprised mostly of elements that are visible by an outsider and that may change depending on the people involved;
- The 'group' level is comprised mostly of elements that are part of group level behaviour and that may change depending on the group affiliation of the people involved;
- The 'society' level is comprised mostly of elements that are part of the underlying culture and that may change depending on the cultural script of the agents involved.

On an interaction level, there are three important elements to consider: the ritual, its physical context, and its participants.

A ritual is the process of two or more people interacting. Besides visible actions, there is also the need to consider the symbolic function of those actions. As argued in Rothenbuhler's work (1998), rituals may range from the ceremonial and memorable to the mundane and transient. In fact, any group of people that has a degree of shared attention can be said to be engaged in a ritual; in other words, all social actions that an agent may take can be considered as part of a ritual. We call the people that are part of a ritual its participants and its location the physical context. Both the participants and the physical context affect the ritual; depending on where it is, and who are present, some symbolic functions may have a different meaning. For example, shaking somebody's hand may be intended as a greeting, but in a different setting, it may be intended as a way to form an agreement.

On a 'group' level, there are also three important elements to consider: moral circles, social norms, and relational variables.

The concept of moral circles is an important determinant of behaviour across social groups (Wilson, 2007). In our work, they are considered a pragmatic concept that can be used to define social order in groups of people. They are primarily used to help describe those who are worthy, versus those who are not; those worthy are granted certain (moral) rights and duties, those unworthy are denied morality. A moral circle is comprised of three elements: the people to whom it applies, i.e. moral circle membership, their mutual perceptions of social attributes, i.e. relational primitives, and the rules that regulate their behaviour, i.e. social norms. It is similar to the concept of reference groups proposed by Kemper (2011).

Relational variables represent relational properties of other individuals, and may differ per person. In our work, we have identified 'status' and 'reputation', and they represent respectively the hierarchical status of a person, and whether the individual is in 'good' or 'bad' standing in a certain moral circle. For example, a boss may receive a higher status due to professional standing from his employees. If he has been a bad boss, by making his employees work late every day, he might be attributed a lower reputation. Both status and reputation will influence how you treat an individual.

Social norms can be used to establish appropriate actions that should be acted out, may be acted out, or are prohibited in specific contexts (Hollander & Wu, 2011). Each Moral Circle may have a set of different or overlapping social norms, and they help to determine appropriate behaviour. For example, it may be accepted to kiss your wife in private, but it may not be as appropriate in public.

On a 'society' level, there is one major determinant that drives behaviour across societies: cultural meta-norms (Mc Breen et al., 2011). In contrast to the specific guides to behaviour, social norms, meta-norms are non-instantiated guides to social behaviour. They influence the relational fundamentals of social life, and they are shared within any society that has the same culture. Cultural meta-norms act as a weighing and salience mechanism for the concepts on the 'group' level. With regards to moral circles and social norms, the cultural script may influence which is more important; for example, is it more important to attend a house-warming party of a friend, or finish an assignment for work? With regards to relational primitives, the cultural script may influence the importance of the primitives; for example, how much status would you attribute to that friend?

4.5 Social Importance Dynamics Model

So far, we argued that to address the problem of creating agents that are capable of portraying different cultures it is important to consider fundamental aspects of human social behaviour, as culture is essentially a social phenomenon that is associated to groups of people and not just single individuals. To this end, we described a number of theoretical constructs that pertain to the social reality of human beings. The aim of these concepts was to describe the social world from a theoretical perspective.

Moving towards a computational perspective, our aim was to create a model that enabled the emergence of these constructs in the agent's behaviour without actually requiring their explicit representation in the agent's beliefs. To achieve this, we developed the Social Importance Dynamics (SID) Model, which is grounded on the status-power theory proposed by Kemper (2011).

This theory was chosen as the basis for the computational model because it argues that all human social activity, including participating in rituals, forming moral circles, following or violating social norms is ultimately motivated by two distinct dimensions, status, and power. Both of these dimensions are represented as a relational scalar between two social entities.

The SID model aims to operationalize Kemper's notion of status, which we will refer to as Social Importance (SI). This notion represents how much are we willing to act in the interest of another social entity, taking into account their needs and wishes above our own. Power, on the other hand, represents the negative side of relational behaviour as it refers to our ability to coerce others to act in our favour. For instance, it is possible to increase our power drastically by aiming a loaded weapon at another person. From that moment on,

the person will now be very willing to act in our best interest.

As a starting point, we want to focus on modelling culturally appropriate behaviour. As such, the proposed SID model focuses on status, assuming that neither agents nor users will attempt to coerce or manipulate others. In Kemper's theory (2011), the status one attributes to another, which we will refer to as social importance (SI), signifies the extent to which one will voluntarily respect or comply with the wishes, needs, and interests of the other.

There are several factors that will influence how much SI we attribute to others, including but not restricted to, friendship, reputation, group membership, professional occupation, conformity to existing norms, and family ties. All of these factors can have an impact on our willingness to act in the interest of another. Moreover, our cultural background plays a major role in determining which factors are more important than others are. For instance, in collectivistic cultures, group membership will be more important than in individualistic cultures.

In terms of how SI affects our behaviour, it works as both a motivational source and a restraining factor.

The former is visible when someone performs an appropriate claim to another as this creates a desire on that other person to do a conferral in response. Such desire comes from the need to reinforce or improve the relation, with different acts conferring different amounts of SI. For instance, consider the difference between explaining directions to someone who is lost and accompanying the person to the desired destination. The restraining aspect takes place when considering how much one should ask to have others acting in our interest, as that will largely depend on the amount of SI they attribute to us. If our request exceeds the limit of what we could request, the other person will likely not comply the way we would like and it is possible that our SI is lowered in their mind.
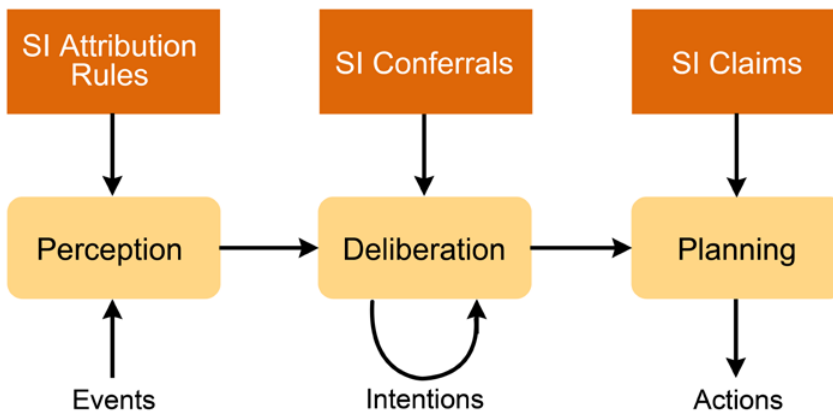
4

Figure 4.2: Applying Social Importance to the BDI architecture.

Aside from the conferrals that are done in response to explicit claims, it is also possible that the situation itself implicitly evokes a conferral. For instance, the situation of meeting a friend implicitly evokes a greeting action as a conferral act, with different types of greetings conferring different amounts of importance. The aim of the SID model is to increase the social intelligence of regular BDI agents by integrating the aforementioned notions in their reasoning and behaviour. As shown in Figure 4.2, the model is based on the following three elements: SI Attribution Rules, SI Conferrals, and SI Claims. Each of these elements will influence a different process of the agent.

4.5.1 Impact on Perception

When modelling social interactions, agents must determine how much social importance they should attribute to each other. In the case of humans, this knowledge is progressively ingrained into our minds; first we learn from our parents, and then from other members of our culture. The purpose of the SI Attribution Rules is to encode such knowledge. Formally, a SI Attribution Rule is defined as a tuple $<T, A, V>$ where:

- T - Specifies the target of the rule;
- A - Corresponds to a list of conditions that specify when the rule is activated;
- V - The amount of SI the target of the rule gains/loses.

Table 4.1: Examples of SI Attribution Rules.

T	A	V
x	isPerson(x)	+10
x	isCoWorker(x)	+10
x	isCloseFriend(x)	+20
x	isCustomer(x)	+5
x	isThief(x)	-10

The perception of the agent is affected by the SI Attribution rules in the following manner. When another agent is encountered, his initial SI will be determined by the sum of all SI Attribution Rules that are activated when considering that agent as the rule's target. Then, each time the agent updates its beliefs, the SI of all other agents is updated by checking if the belief change results in the activation or deactivation of any existing rules (for instance when discovering that someone is a thief).

For illustration purposes, consider a group of agents that share the simple set of attribution rules described in Table 4.1 for the target 'x'. Note the values chosen are merely illustrative and were made under the assumption that the SI that is attributed to other agents is a value ranging from 0 to 100. In this scenario, agents attribute the most importance to other agents that are close friends, as the combined result of simultaneously activating the first (+10) and third rule (+20). Note that the first rule applies to every agent in a social simulation, in which each agent represents a person. As such, the rule represents a default SI value that is attributed to other agents without any other information.

Agents are also able to infer how much SI they have in the perspective of others by using a Theory of Mind mechanism (Dias, Aylett, Reis, & Paiva, 2013). This mechanism applies the same process that is used for updating the agent's own SI values, with the only difference being that the agent switches to the perspective of the other agents when doing so, assuming they have an identical set of SI Attribution Rules.

Finally, other than the SI attribution rules, there is also an automatic mechanism that decreases the SI attributed to another agent whenever that agent performs an inappropriate claim. In turn, this potentially triggers a contempt emotion in the agent with an intensity that is linearly proportional to the exceeded amount of the claim.

4.5.2 Impact on Deliberation

The deliberation cycle of a typical BDI agent starts with the generation of possible goals to pursue followed by the selection of the goal with the highest utility and the creation of an intention to achieve such goal. In his theory, Kemper argues that there are two main motivations concerning status: wanting to obtain status from others, and wanting to confer status to others when it is appropriate.

Our model focuses on the latter, by endowing agents with a general desire to perform acts to signify the amount of SI they have ascribed to others. For the sake of simplicity, the model currently does not include strategies for agents to increase their SI in the perspective of others. While relevant to ensure appropriate social behaviour, implementing such strategies are beyond the scope of this article, as we would deviate from our main goal, which is to model culturally appropriate behaviour.

As stated by Kemper, "Culture specifies what concrete acts and to what degree they signify status-conferral" (Kemper, 2011). The aim of the SI Conferrals of our model is to encode such knowledge. Formally, a SI Conferral is defined as a tuple $<C, A, T, V>$ where:

- C - Is a set of preconditions that dictate the context in which the conferral is appropriate;
- A - Is the name of the action that symbolically represents an SI conferral;
- T - Corresponds to the target agent to which the conferral applies, which is usually the same target of the action but not always. For instance, consider a person who asks you to close a door. The door would be the target of the action but the conferral's target would be the person who made the request;
- V - Specifies the amount of social importance conferred by the action.

Table 4.2: Examples of SI Conferrals.

T	A	V
x	offer-surprise-dinner	30
x	say-happy-birthday	20
x	explain-direction	10
x	accompany-to-destination	30

Some examples of SI-Conferrals are described in Table 4.2. In these examples, C was not represented for simplicity reasons and T corresponds to the same target of the action. The first two examples correspond to two different conferrals that are usually given when it is someone's birthday. While to some it is enough to just congratulate, there are others to whom we would like to confer more, for example by organising a surprise dinner party. The next two conferrals exemplify two possible behavioural responses to a person that asked for a direction (a very low SI claim). In this case, a higher amount of SI is conferred with the effort of accompanying the person to the desired destination.

SI Conferrals affect the deliberative process of the agent in the following manner. For each of them a corresponding goal to perform the conferral act is automatically added. Each of these goals will become active when all the conditions specified in C are true and if T has an equal or superior SI than V.

When a conferral goal becomes active, its utility is determined in a straightforward manner; it is linearly proportional to the amount of SI it confers. The rationale is that agents want to confer as much as they think the other agent deserves but not more. Note that the agent will still choose regular non-conferral goals provided they have a higher utility. Consider a situation where a person invites a close friend to a party. The friend might decline the invitation because he needs to work late on a project for his company and not because the host does not have enough SI.

4.5.3 Impact on Planning

After selecting the goal with the highest expected utility and committing to an intention of achieving such a goal, agents must then search for a valid plan of actions. When the aim is to simulate social scenarios, it is often the case that agents can greatly benefit from the help of others, similar to what happens with humans, who are constantly interacting with one another. Cultural conventions establish what seems reasonable to ask of another and what is not. The purpose of the SI Claims in our proposed model is to endow the agent with knowledge about such conventions, so he can plan more appropriate behaviour in a particular socio-cultural context. Formally, a SI Claim is defined as a tuple $<A, T, V>$ where:

- A - Is the name of the action that is perceived as a claim for social importance;
- T - Is the target of the claim. Usually it is the same target of the action but not always. For instance, consider the claim of borrowing someone's car. The target of the claim would be owner of the car, not the car itself;
- V - Is the amount of social importance the action is claiming.

Table 4.3 provides some examples of possible SI claims, in which T is the same as the corresponding action's target. The first three are possible actions an agent might consider when making a plan to go to an unknown destination. Considering the attribution rules specified in Table 4.1, the agent would have enough SI to ask directions of any other agent

that is a person. However, the same does not apply in the case of asking for a ride or borrowing a car. An agent who would perform these actions for a stranger would be claiming more SI than it has and most likely a stranger would not be willing to abide by the request.

Table 4.3: Examples of SI Claims.

A	V
ask-direction	10
ask-for-ride	20
borrow-car	30
offer-surprise-dinner	30

Agents should not only need to be concerned about their SI in the perspective of others when performing requests, they also should be concerned when conferring SI to others. The last example from Table 4.3 (offer-surprise-dinner) exemplifies this with an action that is simultaneously a SI conferral and a SI claim; while throwing somebody a surprise party can be seen as a conferral, it also puts a claim on the one you are throwing the party for. This allows us to model situations in which people would like to perform an action that would confer more SI but choose not to because they themselves lack SI in the perspective of the other.

The agent's planning process is affected by the SI Claims in the following manner. After a valid plan to achieve the agent's current intention is created, the planner will determine if any of the actions corresponds to an SI-Claim. For each of these actions, the agent will determine if the value of the claim is superior to the inferred amount of SI ascribed by the target agent. If so, the action is removed from the plan and an alternative is searched. If no alternative with a lower claim is found, than the agent drops its current intention, meaning that there is no appropriate way to achieve his desired goal. In reality, a person in this situation might seek a secondary plan for increasing his SI high enough in order to then do the claim. As mentioned before, while modelling this type of status seeking would increase the social intelligence of the agent, addressing this issue is not the focus of this work.

4.6 Modelling Culture

The SID model can be used to represent the dynamics found in social interactions between people; we mediate our relationships through conferrals and claims. Depending on the amount of social importance people think is attributed to them, they can form expectations about how much they can claim to others or what conferrals should they expect. Deviations from these expectations can cause negative emotions and corrective behaviour.

In the previous section, we also described a few assumptions, for example "assuming they have an identical set of SI Attribution Rules". While SI attribution rules vary between people from the same culture as well (think of the stereotypical old man complaining that young people do not 'pay him enough respect'), we can definitely assume that there will be differences between cultures.

We will now discuss how to model the influence of culture on the social interactions that are mediated by the SID model. One possible approach is to manually configure the values assigned to all the elements of the model (attribution rules, claims, and conferrals) in a way that the resulting behaviour of a group of agents reflects the behaviour found in a particular culture.

The main disadvantage in this approach is that it cannot be easily adapted to model several distinct cultures. As such, we propose a more flexible approach that is based on the association between a SI component and a Cultural Influence (this matches the concept of a cultural meta-norm from section 4.4). The latter is formally defined as a pair <D, M> where D corresponds to the name of a dimension of culture (e.g. Individualism versus. Collectivism) and M is a multiplier, either positive or negative, that is applied to modify the value V of the associated SI component. This is done by using the following equation, in which Score(D) corresponds to the score associated to the dimension D in the agent's cultural profile, ranging from 0 to 100 (see Figure 4.3).

$$V_{modified} = V_{initial} + |V_{initial}| * M * \frac{Score(D)}{100} \quad (1)$$

Figure 4.3: Formula to calculate the cultural influence.

The advantage of using this approach is that it becomes possible to adapt the agent's cultural behaviour just by changing the scores associated to their cultural dimensions, as we will now describe.

4.6.1 Culturally Varying SI Attribution

As previously mentioned, the SI attribution rules will influence the Social Importance that agents attribute to others depending on relational primitives. One very important relational primitive that is affected by the Individualism (IDV) versus Collectivism (COL) dimension is the in-group/out-group boundary, or moral circle membership (G. Hofstede et al., 2010). Collectivistic cultures are very sensitive to this distinction, in the sense that people are loyal and helpful towards in-group members while, at the same time, they tend to keep a 'relational distance' towards out-group members. Individualistic cultures on the other hand are less sensitive to this distinction and everyone expects to be treated equally, regardless of the groups they belong to.

Our model represents the aforementioned notions with the general SI attribution rules that are defined in Table 4.4. The result of applying these rules is that, the higher the value of COL specified for the agent's culture, the less SI will agents attribute to the members of an out-group and the more they will attribute to members of the in-group.

Table 4.4: General SI Attribution rules concerning the in-group/out-group distinction. v_1, and m_1, are positive real numbers that need to be instantiated for a scenario.

SI Attribution Rule			Cultural Influence	
T	A	V	D	M
x	out-group(x) = True	$-v_1$	COL	$-m_1$
x	in-group(x) = True	v_1	COL	m_1

4.6.2 Culturally Varying Claims and Conferrals

Culture does not only affect the amount of SI that is attributed to others. It also influences how we judge the appropriateness of certain actions, which in the SID model, is influenced by how much SI an action claims, or confers.

Concerning claims, Table 4.5 shows the ones in our model that are impacted by the Individualism versus Collectivism dimension. The first one corresponds to any form of casual greeting, such as saying "Hi there!" The second claim is associated to questions such as "How are you?" or "What are you doing here?" Finally, the third claim corresponds to an action of joining an existing group, for example sitting next to a group of people in a bar. In the case study, which will be discussed in the next section, this claim was instantiated as sitting next to two friends in a bar. In all three cases, the amount of SI claimed is lowered by how much IDV is specified for the agent's culture. This means that, if the culture of the agents is highly individualistic, such actions are less likely to be perceived as inappropriate, even when performed by a stranger. Conversely, in a collectivistic culture, the potential of when doing such actions is much higher, particularly if you are an out-group member.

Table 4.5: General SI Claims that have a lower value in individualistic cultures. v_2, v_3, v_4, m_2 are all positive real numbers that need to be specified for a concrete scenario. The only restriction should be that $v_2 < v_3 < v_4$.

SI Claim	Cultural Influence		
A	V	D	M
casual-greeting	v_2	IDV	$-m_2$
ask-personal-information	v_3	IDV	$-m_2$
join-group	v_4	IDV	$-m_2$

With regards to conferrals, Table 4.6 details the ones that are influenced by the Individualism versus Collectivism dimension in our proposed model. As one may notice, both were also defined as claims in Table 4.5. The rationale is that given the smaller social risk for strangers to perform these actions in individualistic cultures their performance is also less socially rewarding and meaningful. This is reflected in the sentence "Hi! How are you?" which corresponds to a typical greeting in the US (a highly individualistic culture) and is often misinterpreted by people from other countries who assume that it is an expression of concern.

Table 4.6: General SI Conferrals that have a lower value in individualistic cultures. They share the same values and multipliers with their claim counterparts.

SI Conferral	Cultural Influence		
A	V	D	M
casual-greeting	v_2	IDV	$-m_2$
ask-personal-information	v_3	IDV	$-m_2$

4.7 Case Study

To validate our framework, we have applied the model in the development of an existing intercultural training application named Traveller. Traveller is a tool aimed at young adults (18 to 25 years old), in which users are encouraged to interact with virtual agents from different 'cultures'. They will come across situations, so-called critical incidents, which may be misinterpreted due to differences in culture, in the hopes of raising their intercultural sensitivity and awareness.

Each critical incident features a different setting, in which the user has multiple interaction options. Based on the choice he or she takes, and the culture of the agents, the perceived SI of the user may change, and agents will adapt their behaviour accordingly. In this work, we only focus on the first incident of Traveller, the Beach Bar. The reason is that this particular episode was designed to emphasize the existing differences between individualistic and collectivistic cultures. As implied by its name, this incident takes place in a bar located on a beach to which the user arrives late at night after failing to find the way to his hotel. At the start of the scene, there are only two characters sitting in the bar and they are talking to each other. The barman is absent (although he appears later in the scenario).

The goal of the user is to find directions to his hotel. To solve this problem there are two main approaches: questioning the bar customers or patiently waiting for the barman to arrive and ask him for directions. There are moments where it is possible for the users to switch between the two approaches. For instance, the user might initially go and talk to the characters, but then change his mind and sit away from them and just wait for the barman to arrive or vice versa.

4.7.1 Cultural Differences – Individualism versus Collectivism

At the start of the scene, the main cultural difference is in the SI that the characters attribute to the user based on the rules defined in Table 4.4. As the user plays the role of a foreigner, his or her initial SI will be lower if the agents are collectivistic. The agents will also lower the SI attributed to the user when he or she performs an action that is perceived as an inappropriate claim. To make the user aware that he did something inappropriate, the agents respond with a frowning facial expression as shown in Figure 4.4.

For this particular scenario, the following user actions were associated to the claims shown in Table 4.5. Namely, saying "Hi guys, nice to meet you!" was coded as a *casual-*

greeting. In addition, asking the characters "How are you?" was coded as an *ask-personal-information*. Finally, sitting next to the characters in the bar corresponds to a *join-group* claim. As an out-group member, the user will only have enough SI to perform any of these claims if the culture of the agents is highly individualistic given the cultural influences defined in Table 4.5. Note that the scenario also contains two action choices that are perceived as inappropriate in any cultural configuration. These are asking to if they can sleep at the house of one of the characters in the bar and refusing to order any drink when the barman arrives.

Figure 4.4: Example of two possible conferrals in the beach bar scene in response to a "How are you?" question. The image on the left shows the response in a highly individualistic culture and the image on the right shows a highly collectivistic culture. The frown occurs as a reaction to the user over claiming more than his attributed SI in this culture.

In response to the user's claims, the agents decide which conferral they should perform based on how much SI they attribute to the user at that time. At the start of the episode, collectivistic agents will perform lower conferrals. For instance, if the user decides to sit at the bar alone, collectivistic agents will not speak to the user but individualistic agents will say "Hey! Come join us if you want". Furthermore, if the user behaves inappropriately during the interaction then his or her SI will decrease and the conferrals selected will be even lower. Ultimately, when the user asks for the directions to his hotel, if his behaviour up to then was socially inappropriate, the characters will respond with "I am sorry we do not know! But you should try asking the barman when he comes back". However, if the user behaved inappropriately then the conferral selected will be the following: "We don't know where your hotel is. Maybe you should ask somebody on the street..." For a visual example, see Figure 4.4.

4.8 Cross-Cultural Evaluation

To evaluate the power of our framework in adapting the cultural behaviour of the characters in Traveller, we conducted a cross-cultural study targeting the first episode of Traveller, a critical incident in a beach bar. As was mentioned before, the characters in this

episode can be configured to be highly individualistic or collectivistic. As such, we wanted to compare users from both a collectivistic country (i.e. Portugal) and an individualistic country (i.e. Netherlands) with regards to how they perceived the behaviour of the agents. For reference, Portugal is the most collectivistic country in Europe (scoring 27 on that dimension), and the Netherlands is shared for most individualistic country in Europe (scoring 80 on that dimension.

We conducted an experiment with a 2x2 between-subjects design in which the independent variables were the participant's nationality (Dutch or Portuguese) and the cultural parameterisation of the agents in the beach bar (Individualistic or Collectivistic). The main hypotheses we wanted to verify within this study were the following:

- H1: Portuguese participants have a more positive opinion of the collectivistic agents' behaviour than the Dutch participants do;
- H2: Dutch participants have a more positive opinion of the individualistic agents' behaviour than the Portuguese participants do.

4.8.1 Experimental Design

For the initial cross-cultural experiment, each participant in both countries played a session of TRAVELLER individually. The session was limited to the beach bar episode and the interaction was done with mouse and keyboard instead of the Kinect. The rationale behind this decision was to ensure that the choices the users made would not be influenced by possible difficulties in performing certain gestures. In addition, this facilitated having multiple evaluation sessions running in parallel.

In both Portugal and in the Netherlands, participants were randomly assigned to play the beach bar scene either with agents whose culture was highly collectivistic (IDV = 0) or agents whose culture was highly individualistic (IDV = 100). All other configuration options of the agents' behaviour were the same. Afterwards, they were briefly explained how the user interface worked and they were instructed that TRAVELLER was not a game in the sense that there were no points or victory conditions. Finally, we explicitly asked participants to try to behave in the simulation as close as possible to what they think they would do in the real world if they were facing a similar situation. The reason behind this request was to discourage participants from trying to act in a strange way just to see what would happen in the virtual world, given that this sort of behaviour is very common when playing computer games.

After the participants completed the beach bar episode, they were asked to fill in an online questionnaire about their experience. This questionnaire starts with two open-ended questions: "Did the characters behave in a socially appropriate manner? If not, tell us in which occasions they were socially inappropriate" and "What were you focused on during the interaction?" The purpose of these questions was to provide us with useful insights about the way the participants perceived the behaviour of the characters and to see

what their goals were during the interaction.

After the open-ended questions, the participants were asked to give their opinion, using a 7-point Likert scale, on how much they agreed on several statements. These statements were either related to the impression of the characters' behaviour (Figure 4.5) or were about the user's enjoyment and frustration (Figure 4.6). Afterwards, participants were asked to describe the characters in terms of several adjective pairs. For a list of these pairs, see Figure 4.7. Finally, at the end of the questionnaire, we asked participants to fill in their gender, age, and nationality.

For this study, we had 72 participants of which 37 were Dutch and 35 were Portuguese. In both cases, roughly half of the participants interacted with the individualistic culture and the other half with the collectivistic culture. Participants were mostly university students and their average age was 23 in Portugal and 22 in the Netherlands. Concerning gender, there were fewer female than male participants in both countries. More precisely, the percentage of female participants was 35% in the Netherlands and 22% in Portugal.

4.9 Results and Discussion

The initial step in the result analysis of the cross-cultural study consisted of determining whether the scores obtained for the statements and the adjectives followed a normal distribution. By applying the Kolmogorov-Smirnov, we determined that most distributions of the variables measured were significantly non-normal. As such, instead of using a MANOVA, the Mann-Whitney non-parametric test was chosen to check for statistical significance in this analysis.

Concerning the collectivistic agents, Figure 4.5 shows the cross-cultural results obtained for the statements about the user's opinion on the agents' behaviour and attitude. There were quite a few significant differences between the two countries in their perception of the collectivistic agents' behaviour. Namely, the general impression of the Portuguese participants of these agents was significantly higher compared to the general impression of the Dutch participants ($p = 0.018$, $U = 97.5$, $z = -2.36$, $r = 0.38$).

Portuguese participants also agreed significantly more that the collectivistic characters behaved appropriately towards them ($p = 0.014$, $U = 102.5$, $z = -2.20$, $r = 0.36$) and that the agents treated them as one of their own ($p = 0.009$, $U = 96$, $z = -2.37$, $r = 0.38$). Finally, the Portuguese participants were significantly more inclined to think that the characters enjoyed interacting with them ($p = 0.038$, $U = 114.5$, $z = -1.78$, $r = 0.29$) compared to the Dutch participants. For the remaining statements about the character's behaviours and attitudes, there were no significant differences.

With regards to the statements that pertained to the user's own experience with the collectivistic agents, there were only two significant differences between the two countries.
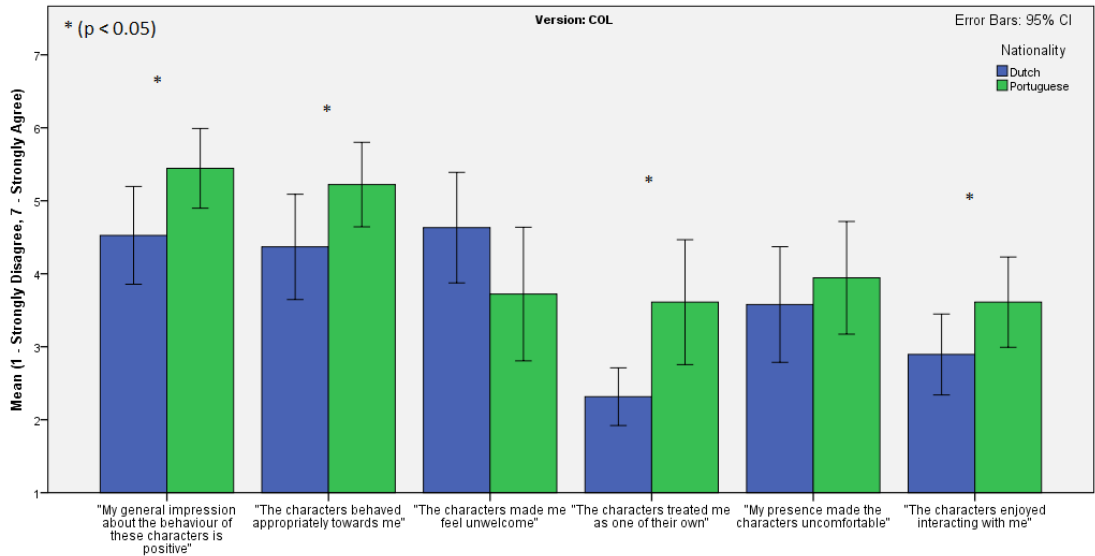
Figure 4.5: Cross-cultural results obtained for the collectivistic agents referring to the statements about the agents' social behaviour.
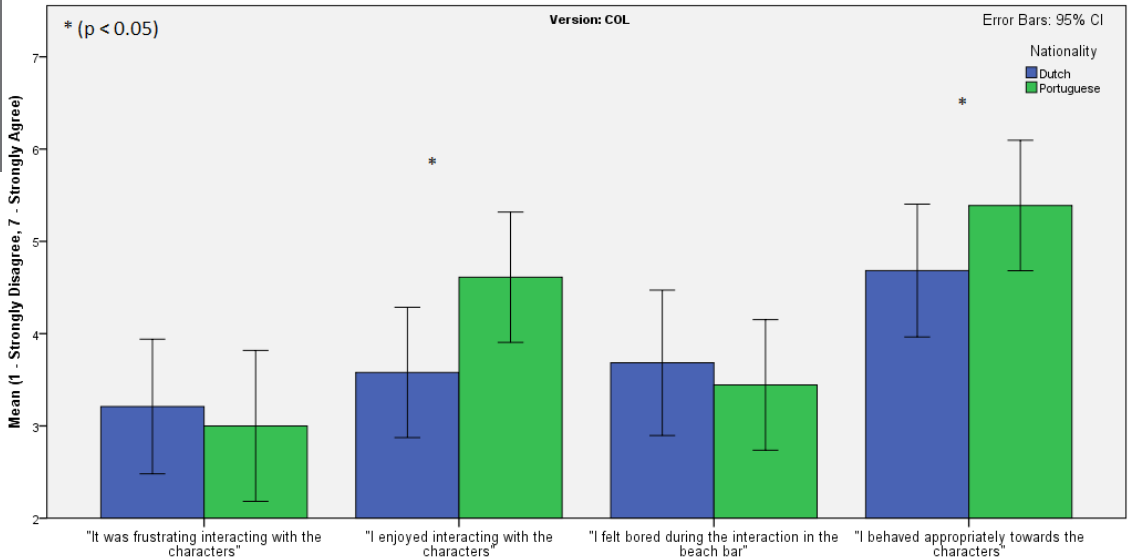

Figure 4.6: Cross-cultural results obtained for the collectivistic agents referring to the statements about the users' behaviour and experience.

Namely, as shown in Figure 4.6, Portuguese participants enjoyed their interaction significantly more with the collectivistic agents ($p = 0.016$, $U = 102$, $z = -2.146$, $r = 0.35$) and they rated their own behaviour as more appropriate ($p = 0.035$, $U = 115$, $z = -1.817$, $r = 0.30$). No significant differences were found with regards to the users' frustration or boredom while interacting with the characters.

Lastly, with regards to the adjectives that the participants chose to describe the collectivistic agents, there were few significant differences (see Figure 4.7). More precisely, compared to the Portuguese, Dutch participants only perceived the collectivistic agents as significantly more unassertive ($p = 0.013$, $U = 99$, $z = -2.27$, $r = 0.37$) and more disrespectful ($p = 0.017$, $U = 104.5$, $z = -2.12$, $r = 0.35$) but there were no other significant differences.
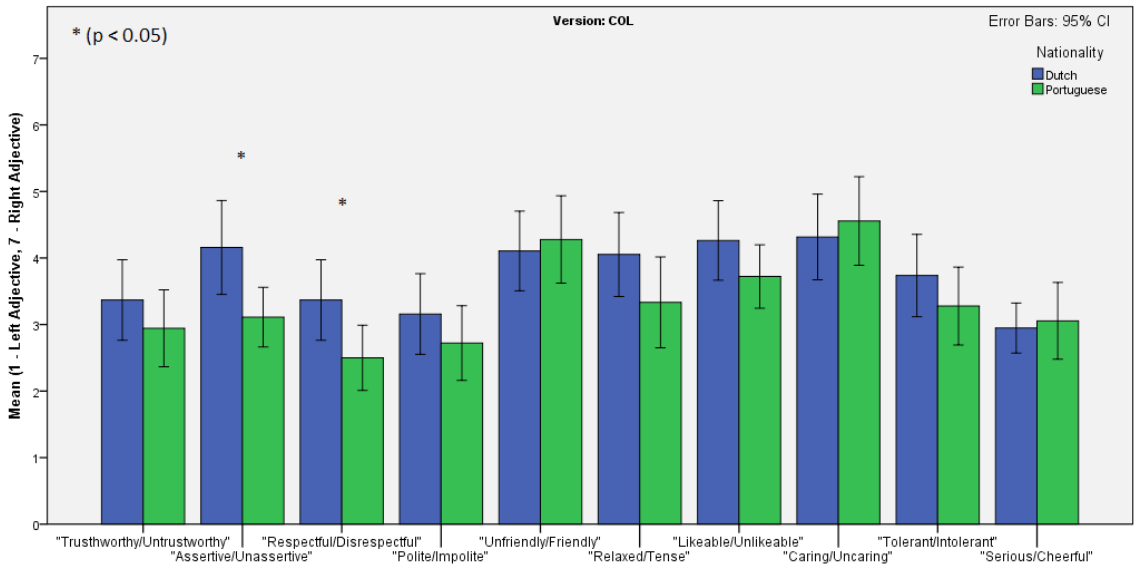

Figure 4.7: Cross-cultural results obtained for the characterization of the collectivistic agents.

The aforementioned results seem to strongly support our hypothesis H1, i.e., Portuguese participants had, overall, a more positive opinion of the collectivistic agents when compared with the opinion of the Dutch participants. This is an important result because it indicates that the behaviours of the agents, when adapted by the SID model to become more collectivistic seem to resonate more with people from a collectivistic culture, thus attesting the capability of the model.

So far, we have analysed how the collectivistic agents were perceived by participants from both countries. We will now shift our attention to the individualistic agents instead, repeating the same form of analysis that was previously done. Starting with the statements about the characters' behaviour, the results are shown in Figure 4.8. Unlike what happened with the collectivistic culture, there were no significant differences in the way the Dutch and the Portuguese participants perceived the individualistic agents. Namely, both user groups had a similarly positive impression of these agents.

There was also no significant difference concerning the statements that pertained to the user's own experience with the individualistic agents (see Figure 4.9). Finally, with regards to the adjectives chosen to describe the individualistic agents only one significant difference was found between the two countries (see Figure 4.10). Namely, Portuguese participants found the individualistic agents significantly more assertive ($p = 0.048$, $U = 104$, $z = -1.718$, $r = 0.29$).
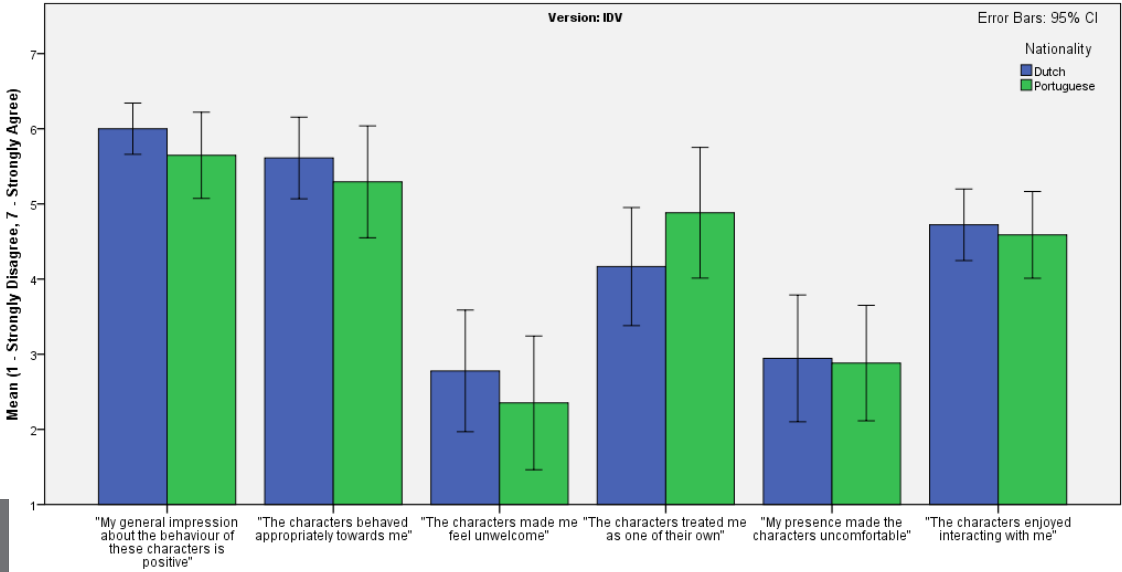

Figure 4.8: Cross-cultural results obtained for the individualistic agents referring to the statements about the agents' social behaviour.
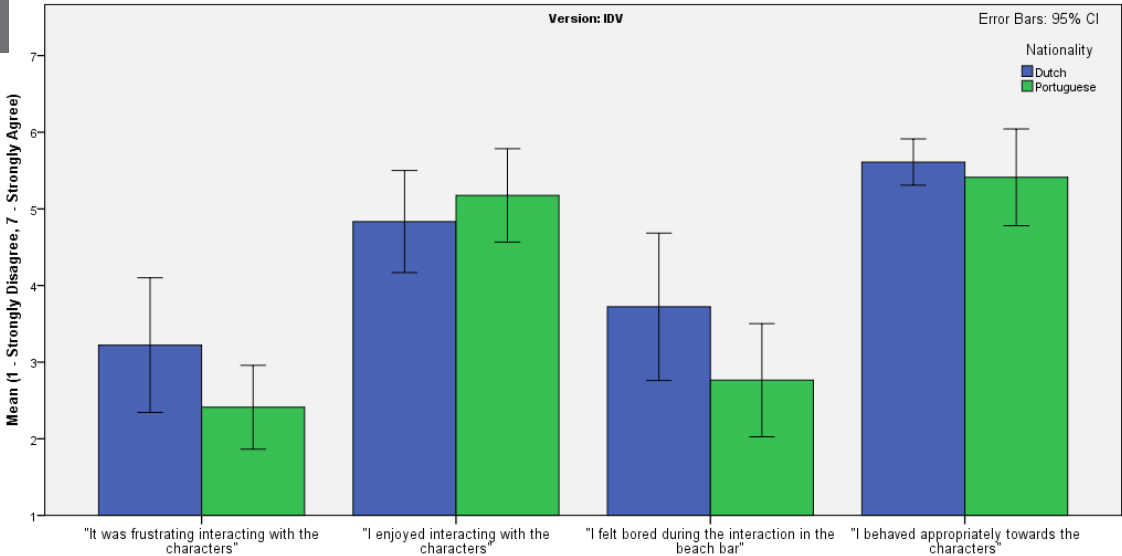

Figure 4.9: Cross-cultural results obtained for the individualistic agents referring to the statements about the users' behaviour and experience.
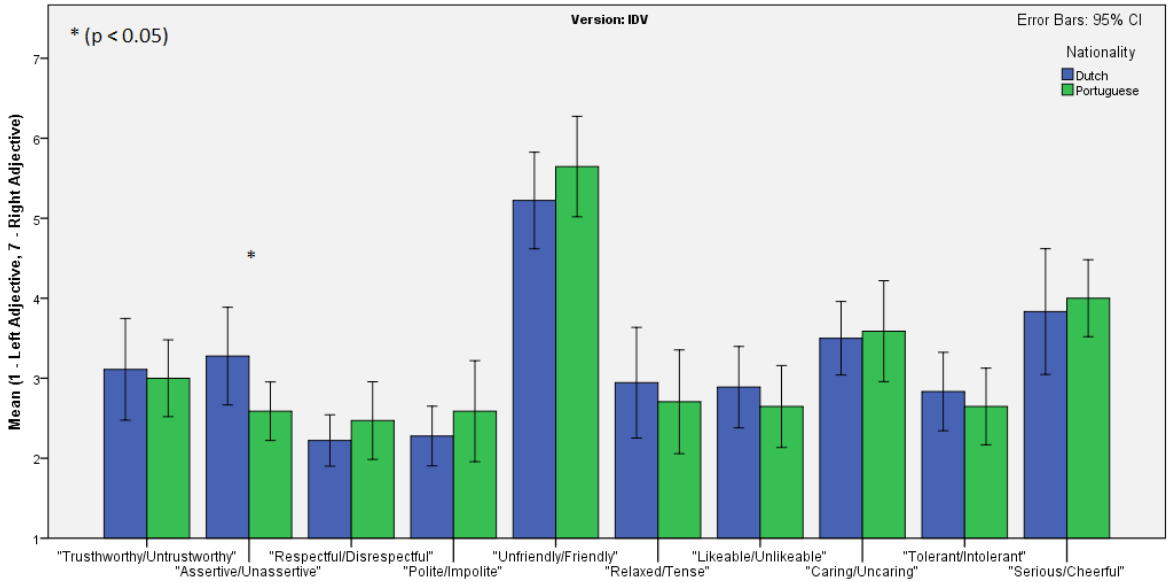
**Figure 4.10: Cross-cultural results obtained for the characterization
of the collectivistic agents.**

Overall, the results obtained for the individualistic agents do not support our hypothesis H2, in the sense that both Portuguese and Dutch participants had a similar positive opinion of these agents. A possible explanation is that the scenario chosen, namely the beach bar, was not rich enough in the sense that it lacked opportunities for the user to perform socially inappropriate actions from the individualistic agents' perspective. This was due to the strong design focus of the scenario on exploring the negative consequences of being an out-group member, i.e. a foreigner, which is associated with collectivism.

4.10 Conclusion

In this article, we have described the creation of virtual agents that are able to show culturally varying behaviour. There were two parts to this approach: the integration of culture into models for virtual intelligent agents, and the operationalization of one dimension of culture, individualism versus collectivism, into our model, as part of a specific application.

In the first part, we identified relevant existing work, and then applied that work to create a model for social interaction that can be influenced by culture. As such, we are able to autonomously generate emergent behaviour based on predefined synthetic cultures.

In the second part, we instantiated the model for a specific application, an intercultural training tool. Based on an evaluation with participants from two cultures, we found that our model can be used to create culturally varying behaviour based on the individual-

ism versus collectivism dimension. In particular, the results supported our hypothesis that Portuguese participants perceived the collectivistic agents as more appropriate than the Dutch participants.

There are a few limitations to this work. The first is that we have applied the work only to a specific context. As such, the social interaction in that context is extremely limited; the agents do not build lasting relationships, social norms do not change, and the participants involved stay the same. We only take the first steps in this research, but in the future, additional social dynamics would need to be modelled (such as the influence of power, and establishing lasting relationships).

The second is that the model is only instantiated for one dimension of culture in one specific application. Other dimensions were also involved in the design of the critical incident, but they currently do not vary. As such, they might have an influence on the perception of the agents' behaviour. In future work we will apply different dimensions of culture to the model, to ensure that the agents are able to show a wider range of appropriate culturally varying behaviour. This would require additional evaluations with people from different cultures.

The third is that the values for the Social Importance attribution, claims and conferrals, together with the cultural modifiers, are currently predefined based on the synthetic culture descriptions described in Hofstede's work (G. J. Hofstede et al., 2002). For now, we have only focused on the relative values of these items, instead of absolute values. In future work, such values would need to be validated to help establish appropriate behaviours.

While there are still many limitations, we believe that we have taken the necessary steps to create agents that can show appropriate culturally varying behaviour. Our work can be used to further our understanding of cultural differences, and empower people to train themselves effectively in different cultural settings.

Chapter 5

Designing a Digital Intercultural Sensitivity Training Tool that is Culture General

"It's the questions we can't answer that teach us the most.
They teach us how to think.
If you give a man an answer, all he gains is a little fact.
But give him a question and he'll look for his own answers."
Patrick Rothfuss

Abstract

Cultural differences may lead to misunderstandings. These may be mediated by learning from misinterpretations of behaviours in intercultural contexts through critical incidents. Existing tools use critical incidents to train about specific cultures, but few target general cultural differences, of which none are available digitally. In this work, we take the first steps to create a digital culture-general training tool that can be accessed whenever and wherever. In the first part of the article, we focus on different aspects and methods of intercultural training. This information is then used in the second part to evaluate the effect of these different methods on the perception of behaviour in critical incidents. We found that experiential and story-based approaches led to participants being more critical of their own behaviour. In the third part, we expanded on these critical incidents, and used virtual characters, to evaluate if experiential incidents in an embedded story can lead to an attribution of perceived differences in behaviour to specific differences in culture, and to users becoming less judgemental of inappropriate behaviours by people from different cultures. The results suggest that the tool had some effect, but that a debriefing relating the cultural differences to specific instances would be beneficial.

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5.1 Introduction

It is becoming increasingly important that people from over the globe are able to work and live together. In 2010 alone, out of the 501 million people living in Europe, 47 million people were born in a different country than the one they are staying in (Vasileva, 2011). If you are a European, there is a large chance you are going to have to interact with people from other countries.

Interacting with people from different cultures may broaden your horizon, but it may also lead to social stress; integration is not always a smooth process, and cultural differences may lead to misunderstandings or even conflicts. If such problems keep occurring, they may eventually lead to the creation of negative stereotypes, which may then influence future interactions with people from those cultures.

Adept management of intercultural encounters poses great demands on people who are to interact with people from other cultures that live according to unfamiliar rules and customs. A psychological framework for behavioural components of such interactions is provided by the culture learning theory. This theory draws on social psychology, social skills and interpersonal behaviours (Argyle, 1969), to describe social processes taking place between people who are new to a given culture and members of that culture.

According to the culture learning theory, intercultural interactions closely resemble any other type of social interactions in that they can be easily disrupted when the parties engaged fail to regulate the interaction appropriately. Generally, this occurs when they are not familiar with conventions that guide the other's behaviour. Do note that these conventions are merely instantiations of the underlying values of a culture; the difference in expectations is primarily due to different structures of the social fabric (G. Hofstede et al., 2010).

Foreign etiquette has a variety of components one should be acquainted with if the intercultural interaction is to develop smoothly. These entail norms concerning expression of emotions, proper use of posture, gaze and silence for communicating non-verbal messages, and performance of various routines, for example greetings (Trower, Bryant, & Argyle, 1978). When people from different cultural backgrounds violate each other's expectations as to the above-mentioned activities, effective intercultural interactions may be endangered.

These violations of expectations may be prevented through relevant culture-specific knowledge, but if they do happen, it is also important to consider soft skills, such as conflict resolution and being able to empathize with other people (Ting-Toomey, 1999); such

skills may help mediate emotional problems that occur due to misunderstandings and conflicts. Since they are applicable in a wide range of contexts and people, they can be used to become more competent at managing intercultural interactions in general.

The above elements have been the focus of intercultural training in the last few decades. Best practices have shown short-term and long-term benefits (Black & Mendenhall, 1990), enabling people to become more capable with regards to a wide range of problems, ranging from being able to deal emotionally with intercultural conflicts, to being able to behave appropriately in a given cultural context.

There are different variations of intercultural training, and they are largely determined by the aim of the training. Culture-specific training focuses on just one particular culture or on predetermined intercultural interactions. Here methods such as role-plays and simulations concerned with a specific culture are usually beneficial (Cushner & Brislin, 1997). Culture-general training prepares trainees for various interactions with people from a broad range of cultures. Most often, it is based on role-plays, culture assimilators and sensitisers, which challenge the trainees' interpretations of behaviours in intercultural situations, cross-cultural analyses and dialogues which puts the trainees right into the environment they will have to function in (Fowler & Blohm, 2004).

One way to gain a greater understanding of differences due to culture is by learning from misinterpretations of behaviours in interactions between people from different cultures. Such interactions is what Fiedler et al. refer to as so-called critical incidents (1971). Learning from these incidents usually involves two steps 1) trainees need to become or made aware of misunderstandings or conflicts that occurred during an interaction between people from different cultures, and 2) they need to understand the underlying reasons for these misunderstandings, i.e. relate the differences in behaviour or interpretation to specific differences in culture (a so-called debriefing).

Traditionally, this form of intercultural training requires professional trainers to lead training sessions, and professional actors, or fellow trainees, to participate. Those involved are required to be in the same location at the same time. This can lead to training sessions being very expensive, time-consuming, and difficult to organise.

To deal with these potential problems, researchers have been looking into creating digital intercultural training tools that enable interested people to train their ability to deal with misunderstandings due to culture without having to attend an, potential expensive, on-site training session. Such a tool would need to be self-contained, as interested people should be able to run these digital tools on their own (for example from their own personal computer).

Since you cannot employ actors or recruit other participants in a self-contained digital tool, there is a need for these tools to simulate social interaction to ensure that trainees can experience situations in which expectations are violated due to differences in culture. Usually so-called virtual characters are employed, which are able to behave according to a

set of pre-defined rules.

There are few examples of digital culture-specific training tools involving critical incidents, such as ELECT BiLAT (Hill et al., 2006) or TLCTS (Johnson & Valente, 2008). However, currently no digital training tools specifically target culture-general skills through interactions between people from different cultures. As such, there is little knowledge on how to establish the aims and the content of these training tools.

In this article, we take the first steps to creating such a digital culture-general training tool. In the first section, the theoretical background, we discuss the aims of our training tool based on our own intercultural training framework, establish the design requirements needed to achieve these aims, and discuss different methods of intercultural training. In the second section, we discuss our first experiment, in which we create a set of intercultural incidents based on the requirements, and compare different methods of intercultural training to see which is the most effective at achieving our aims. In the third section, we discuss our follow-up experiment, in which we created a prototype culture-general training tool, based on the results of the first experiment, and evaluated whether the tool can be used as-is, to achieve part of our aims.

5.2 Theoretical Background

In this chapter we present the aims of our tool based on our intercultural training framework, discuss the requirements of a training tool that aims to achieve those aims, and describe which methods of intercultural training need to be considered in the design of such a training tool.

5.2.1 Aims of Intercultural Training

The goal of intercultural training is to create an overall improvement of people's performance in intercultural situations (Gudykunst et al., 1996). To develop an intercultural training tool, it is important to define the intended outcomes of the training, so the tool can be tailored to these outcomes, thereby increasing the likelihood of the training being successful. Intercultural training models can help to structure this process, by bridging the gap between trainees, theory and learning outcomes.

We started out using the Developmental Model of Intercultural Sensitivity (DMIS) for intercultural training (Bennett, 1986, 1993). In this model, a traveller in a foreign country will go quite linearly through six stages: denial, defence, minimization, acceptance, adaptation, and integration. These stages range from not being aware of differences due to culture, to being aware of these differences and considering the other culture to be inferior, to accepting that there are differences and that the other culture isn't inferior or superior, to fully embracing the world view of another culture.

Although the model is strong in modelling systemic stages of change, there are several drawbacks. Firstly, it does not specify the interpersonal and intercultural competence traits that facilitate or moderate the course of such change (Spitzberg & Changnon, 2009).

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Secondly, the DMIS assumes that people progress from one cultural learning stage to the next in a predetermined order. At this point, there is no clear empirical evidence that the acquisition of intercultural sensitivity follows such a linear path. We hypothesize that this is dependent on the a-priori attitudes of people toward a certain group. Lastly, the evaluation tool for the DMIS model is proprietary and not open to the type of validation we would require.

Instead of focusing on the DMIS, we have chosen to target three spheres of influence. Previous research shows that there are different types of learning goals to consider; Kraiger et al. (1993) mention three particular types of training goals: affect, cognition, and behaviour. Affective, cognitive, and behavioural changes should enhance development of sensitivity, awareness, and communication and interaction competence, respectively, and each of these components can be associated with new, distinct abilities (Chen, 1997; Gudykunst et al., 1996).

Awareness in the context of intercultural training indicates that people need to be prepared for self-reflection as they try to understand the influence of their cultural background on the way they perceive, interpret, and act out behaviour. This will require trainees to 'become aware of' differences and similarities between their own cultural background and that of other people (Brislin & Yoshida, 1994). These discrepancies might lead to conflicts and misunderstandings, which will require the user to become less judgemental towards the behaviour of people from other cultures, and try to be become more empathic, or sensitive, to the others' perspective (Brislin & Yoshida, 1994). Involvement in interaction includes being responsive, perceptive, and attentive (Cegala, 1981), which finally helps in engaging in effective communication.

Type of Learning Goal / Stage of Learner	Emotional Goals	Cognitive Goals	Behavioural Goals
Beginner (conscious incompetence)	Be able to recognize your emotions (e.g. fear and anxiety), when dealing with strange behaviours of another group	Start learning the specific practices and values of another group	Be fully present in attending to the other's verbal and non-verbal messages
Journeyman (conscious competence)	Be able to observe the behaviour of another group without feeling prejudice	Understand, on a basic level, the differences and similarities between another group and your own	Practice skills learned in the previous stage and experiment with different forms of behaviour
Expert (unconscious competence)	Be able to share the emotions (e.g. sadness and happiness) of a member of another group, and other's experiences through empathy	Discriminate and select appropriate strategies in cultural contexts	Be able to unconsciously participate in a group as a native

Figure 5.1: Intercultural learning framework.

Based on the description of these spheres of influence, we have created an overview of learning outcomes for intercultural training. This overview can be found in Figure 5.1 and is categorised in the three types of learning goals, affect/emotion, cognition, and behaviour, and in three stages, shown in order of increasing difficulty from top to bottom.

It is important to note that, to be classified as a beginner in this framework, the person should first be aware of misunderstandings or conflicts due to differences in culture.

5.2.2 Designing a Digital Culture-general Training Tool

The above framework can be interpreted from a culture-general or culture-specific perspective; depending on the intended aim of the training, the framework can be instantiated differently. In this article, we focus on the design of a culture-general training tool, so we do not intend to apply the learning framework to a specific culture. Goals such as "start learning the specific practices and values of another group" will instead revolve around understanding general practices and values of people from different cultures.

This leads to a set of implications for the design of a culture-general tool, as one would have to ensure that the interactions between people from different cultures are be based on general, instead of specific, differences in cultures. To ensure learning accurate details about other cultures, it important that these interactions are not based on hypothetical situations, or based on anecdotal experiences of trainees, but are instead based on theoretical frameworks of culture (as also argued by Fowler and Pusch (2010)).

Based on the information presented so far, we can identify certain requirements for the trainees that need to be met during the use of the training tool.

Trainees need to…

- … be confronted in some manner with an interaction between one or more characters involving a misunderstanding or conflict due to culture;
- … be aware that a misunderstanding of conflict has occurred;
- … be aware that the misunderstanding or conflict occurred due to difference in perception, interpretation, or agency rooted in cultural differences;
- … understand that the misunderstanding or conflict is based on a theoretically valid manifestation of culture.

To ensure that trainees are able to do so, we need to determine …

- … the theoretical framework of culture to use, to ensure that a trainee is confronted with believable and realistic interactions in which misunderstandings due to culture occur;
- … the way we present these interactions to the user; what method of intercultural training can be used to achieve our aims.

We will tackle these two problems in the coming sections.

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Modelling culture

As mentioned before, we need to ensure that trainees are confronted with believable and realistic interactions in which misunderstandings due to culture occur. To do so, trainees should encounter characters that behave according to similar rules as people from existing cultures. In a review of intercultural simulation games, Fowler and Pusch (2010) note that "there has been nothing truly new in intercultural games since the turn of the century", and suggest that the synthetic cultures created by Hofstede and Pedersen (1999) hold a lot of promise for the future because of their theoretical value.

These synthetic cultures are based on the extremes of Hofstede's dimensions of cultures, which describe societal issues, to which each society has found a shared solution (G. Hofstede et al., 2010). There are different manifestations of culture (Ting-Toomey, 1999), which Hofstede et al.(2010) divide into practices and values. Practices are the most visible manifestation of culture, for example the way people from a certain culture dress; values are a less visible manifestation of culture, for example the traditions or beliefs of a group of people. It is important to consider both elements when trying to model culture.

Hofstede et al. have identified six dimensions of culture, namely (1) power distance, (2) individualism versus collectivism, (3) masculinity versus femininity, (4) long-term versus short-term orientation, (5) uncertainty avoidance, and (6) indulgence versus restraint. As a first step, we have only decided to incorporate the first three dimensions into our training tool. We will discuss these in more detail.

Power distance deals with the extent to which less powerful members of a society expect and accept that power and rights are distributed equally or unequally. For large power distance, group membership is dependent on position in society, and people from a 'lesser' group are not consulted, while for small power distance, people of a society can expect to belong to any group, regardless of their position in society.

Individualism versus collectivism deals with the extent to which members of a society feel responsible for themselves or for the larger group they belong to. For individualism, rights and obligations should be the same for all people, while for collectivism, the boundary of the in-group is considered a moral boundary beyond which typical in-group norms do not hold.

Masculinity versus Femininity deals with the extent to which members of a society focus on performance and winning or taking care of the weak. For masculinity, people in general cannot be assumed to be trustworthy, men are supposed to be tough, and women subservient, while for femininity, there is a lot of focus on seeking consensus and taking care for those who cannot take care of themselves.

The synthetic cultures have primarily been used in non-digital intercultural training games (G. J. Hofstede et al., 2002). We build on previous work involving the use of synthetic cultures to create critical incidents that represent differences across cultures (Degens et al., 2012; Degens, Hofstede, et al., 2014; Mascarenhas et al., 2010).

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Methods of intercultural training

To help users become aware of misunderstandings or conflicts due to differences in cultures, trainers have developed different approaches for intercultural training, and they mainly revolve around 'learning by doing', or 'learning by telling'. This dichotomy has been very central to the discussion of effective intercultural training tools. Cushner and Brislin (1997) state that learning in intercultural training tools may happen experientially or didactically. The aim of experiential intercultural training is to have the user learn about different cultures through life-like interaction with (simulated) characters from those cultures. The aim of didactic intercultural training is to have the user learn more about different cultures by providing them with factual information about these cultures. With regard to factual intercultural training, we believe that the word 'didactic' is ill chosen. It seems to imply that experiential approaches are not (as) didactic. Both forms of training have their didactic elements, and we believe that using the word didactic for one over the other is confusing. In this article, we will use the word factual rather than didactic.

An experiential approach to intercultural training rests on the assumption that the best way to teach the trainees about another culture is to make them experience this culture directly or via simulation (Cushner & Brislin, 1997). Experiential methods include role plays, in which people act as if they were engaged in a real cross-cultural encounter, simulation games, most popular of which is BaFá BaFá (Shirts, 1995) with its version for children called RaFá RaFá, and other intercultural exercises that are based on the content of a specific training session (Fowler & Blohm, 2004). All of these activities are designed to give the trainees a set of concrete skills that may be applied in unfamiliar situations, and to practise them in safe environment that provides feedback (Fowler & Blohm, 2004).

Some intercultural training tools may focus just on the interactions between people with different cultural rules, but others sometimes include a story like environment. For example, in ELECT BiLAT (Hill et al., 2006), American army soldiers are prepared for conducting bilateral negotiations in Iraq. They are guided through a story that might be similar to what they would expect to find in Iraq, and during that story, they have to interact with virtual characters that show believable Iraqi behaviour. By experimenting with behaviours and perceiving what the virtual characters do, trainees become more aware of the specific practices that are considered appropriate in Iraq.

Methods that are primarily factual, aim at achieving a cognitive understanding of a given topic through equipping trainees with factual information about another culture (Cushner & Brislin, 1997). Such knowledge is ordinarily distributed via lectures, written materials, for instance manuals and workbooks, films, tapes, and field trips, but also through self-assessment tools that allow for exploration of the trainees' private attitudes, case studies requiring the trainees to find a solution to a cross-cultural issue, and critical incidents presenting conflicts stemming from cultural differences (Fowler & Blohm, 2004).

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One example of a factual training tool involving interactions between people from different cultures is the Culture Assimilator (Fiedler et al., 1971). These assimilators have certain characteristics (based on the description of critical incidents from Flanagan's work (Flanagan, 1954)):

"For the purpose of developing culture assimilators, the ideal incident must describe (a) common occurrence in which a [trainee] and a [person from a another culture] interact, (b) a situation which the [trainee] finds conflicting, puzzling, or which is likely to misinterpret, and (c) a situation which can be interpreted in a fairly unequivocal manner, given sufficient knowledge about the culture. Finally the incident must be relevant to the [trainee]'s task or mission requirements" (Fiedler et al., 1971).

After a user has observed the relevant context, they can then choose between four different responses, of which one is considered correct. They then get feedback based on their choice. Learning happens in three stages: first, when the user becomes aware that their assumptions about the behaviour within the critical incident are incorrect, second, when the user understands what other assumptions they should have made, and third, when the user understands on which observations these assumptions can be based.

These Culture Assimilators may also be used in culture-general training, for example through culture-general assimilators (Bhawuk, 1998). The first of which was the *culture-general assimilator* created by Brislin (1986). Culture-general assimilators are very similar to culture-specific assimilators, in so far that they also feature critical incidents, and are presented in a similar manner. The difference is in the fact that they focus on themes that can be applied to interactions with people from any culture, such as Anxiety or Prejudice.

In the last few decades, researchers have been trying to decide whether an experiential or factual approach yields more effective intercultural training, but it seems there are no clear answers.

Earley (1987) was one of the first researchers to empirically compare an experiential approach to a factual approach. He contrasted two groups, one group that participated in role-play simulations for intercultural training, and another group that received written materials, comparing the U.S. to South Korea. Earley found that both forms of training had a beneficial effect, but he did not find any significant differences in effectiveness. Participants did prefer the experiential approach. This result was also found by Hammer and Martin (1992), who found that the combination of both experiential and factual training was additive. They also found that to reach affective objectives one could better focus on experiential training.

Pruegger and Rogers' (1994) research led to a different set of conclusions. They contrasted four groups; the first two groups participated in a role-play simulation for intercultural training; the third group attended a lecture about differences in culture; and a

comparison group. The authors concluded that experiential learning is significantly more effective concerning attitude change in intercultural training experiences than factual learning.

5.2.3 Conclusion

It is clear that the different methods of intercultural training may lead to different results in different contexts, and as such, it is important to understand which method is most useful in the design of our tool.

In the first experiment, we have used the synthetic culture descriptions to create a set of believable critical incidents that are then presented to users in different styles (that vary based on the methods of intercultural training). We have seen from our intercultural learning framework in section 5.2 that it is important that trainees become aware of misunderstandings and conflicts due to differences in culture. As such, we aim to evaluate the impact of these different styles on the perception and interpretation of the behaviour in those incidents.

In the second experiment, we will create additional incidents in a culture-general prototype, again using the synthetic culture descriptions, and evaluate whether the prototype can be used to make users progress through the learning framework described in section 5.2. Specifically, we are interested to see if the critical incidents can be used to make users aware of cultural differences and less judging of inappropriate behaviours.

5.3 Experiment 1

In the first experiment, we take the first steps in the design of a digital culture-general training tool. As it is crucial that participants become aware of the conflicts that occur in interactions with people from different cultures, we need to determine the effect of different methods of intercultural training on how participants perceive and interpret their own behaviour and that of others in an interaction. To do so, we have created two critical incidents in which a misunderstanding may occur due to a difference in culture, adapted these incidents to represent the methods of intercultural training described in the theoretical background, and evaluated the effect of these adapted incidents on the perception of participants. These critical incidents do not yet involve virtual characters, but are instead scripted and text-based.

We have decided to model the experiential approach similar to existing intercultural training tools using role-play (but smaller in scope). In experiential critical incidents, users should feel like they are participating in real interactions, and feel that they are in charge of their own behaviour. As such, these critical incidents are presented in a first-person perspective, i.e. 'you' versus 'he', and users can select one of four possible actions, which lead to different outcomes for each action.

We have decided to model the factual approach similar to Culture Assimilators. In factual critical incidents, users should not feel like they are the one participating in an in-

teraction. As such, these critical incidents are presented in a third-person perspective, i.e. 'he' versus 'you', and users cannot change the outcome; instead, the users are presented the outcome that was chosen by the designers to be the most conflicting out of the four actions available in the experiential incidents. Do note, in contrast to regular factual approaches, we are not offering additional reflective questions after the incident. This is why we will refer to these incidents as non-experiential in this paper.

An additional component that we have chosen to vary is story elements. We found that existing intercultural training tools sometimes include an overarching story that is used to connect critical incidents, for example in ELECT BiLAT, while this is not included in other tools, such as in the Culture Assimilators. It may be that including such story components also influences the perception of trainees, so it is important to check the exact influence. In the story conditions, the users are told that they are searching for their grandfather's long lost treasure. Before and after each incident, they will read how that incident relates to their treasure hunt and what they do in-between. In the non-story conditions, participants only deal with the incidents; there is no story before and after each incident.

Based on these variations, we created a between-group design in which participants are assigned to different experimental conditions. There are five different conditions, and they can be found in Table 5.1 below. Condition 1 to 4 feature comparable incidents; they have similar content, but just vary in style and interaction. Condition 5 is intended as a control condition, there are no critical incidents. Instead, the user is only presented in-between texts of the story conditions; whenever a critical incident would normally occur, it is skipped.

Table 5.1: Different components in each condition.

	Type of Critical Incident (CI)	Story
Condition 1	Experiential	No Story
Condition 2	Experiential	Story
Condition 3	Non-experiential	Story
Condition 4	Non-experiential	No Story
Condition 5	No CI	Story

5.3.1 Modelling the Incidents

In the first critical incident, we have decided to model one aspect of individualism, namely the boundary between in and out-group members. The main character, who is lost and needs directions, comes from an individualistic culture, and goes up to some strangers and asks them for directions. The characters he will have to interact with are from a collectivistic culture, and do not feel it is their obligation to help.

Bob, the main character, is visiting a foreign country. Unfortunately, he is lost and needs directions to his hotel. He walks into the bar to see if anybody there can help him. When he enters, he sees that there are only two people in the back. They are deep in conversation and there is no barman present. Bob approaches the table in the back corner and asks the people there for directions. They stop talking, and one of them replies that they do not know where Bob's hotel is. Bob thanks them, and leaves the bar. Unfortunately, he was not able to find the hotel, and arrived hours later.

In the second critical incident, we have decided to model one aspect of power distance, namely the influence of status on behaviour. The main character, who needs permission from someone with a high status, comes from low power distance culture, and asks for permission as if he were an equal. The characters he will have to interact with are from a large power distance culture, and feels that they should be treated with some more respect.

Bob needs permission from a park supervisor to enter a wildlife park. He finds the supervisor and his subordinate at the opening of a museum. The supervisor is deep in conversation with another person. Bob goes up to the supervisor and asks for permission, as if he were an equal. The supervisor looks at him angrily, and asks Bob why he dares to disturb him while he is talking to an important friend. He carries on with his conversation as if Bob was not there. After a short while, Bob decides to leave. While he heads to the exit, he bumps into the supervisor again, who, in the end, gives him permission to enter the park if he is better behaved in the future.

In the experiential incidents, the user can select one action per incident, and, depending on that action, a corresponding outcome.

First incident

Option 1 - Sit at the bar and wait for a while

A barman enters, asks if he can help you. You tell him you need directions to a certain hotel, and he tells you where you can find it. You leave the bar, and you find the hotel a short while later.

Option 2 - Approach the table in the back corner

The people at the table ask you if there is anything that you need from them. You tell them that you need directions. They tell you to wait for the barman. The barman enters, and asks if he can help you. You tell him that you need directions to the hotel, and he tells you where you can find it. You leave the bar, and you find the hotel a short while later.

Option 3 - Ask the people in the back corner for directions

You ask the people at the table for directions. They stop talking, and one of them

replies that they do not know where your hotel is. You thank them, and leave the bar. Unfortunately, he was not able to find the hotel, and arrived hours later.

Option 4 - Ask the people in the back corner for directions

You do not know where to go, and so you get lost. You finally arrive at the hotel a few hours later.

Second incident

Option 1 - Go up to the supervisor and ask for permission, as if he were your superior

You ask the supervisor for a minute of his time, and he tells you to wait for a bit. In the meanwhile, he carries on with his conversation as if you were not there. After a while, the supervisor says goodbye to his friend, walks up to you, and ask what he can do for you. You tell him that you need to go into the park, and he gives you permission.

Option 2 - Go up to the supervisor and ask for permission, as if he were your equal

The supervisor looks at you angrily, and asks you why you disturb him while he is talking to an important friend. He carries on with his conversation as if you were not there. After a short while, you decide to leave. While he heads to the exit, he bumps into the supervisor again, who, in the end, gives him permission to enter the park if he is better behaved in the future.

Option 3 - Go back to the guard and ask him if he can introduce you and if he can explain the situation to the park supervisor

The guard is unsure, but tells the supervisor that there is a guest to see him. The supervisor says goodbye to his friend, and asks you what he can do for you. You tell him that you need to go into the park, and he gives you permission.

Option 4 - Go back to the guard and tell him that he needs to introduce you and explain your situation

The guard goes to the supervisor, and announces that there is an esteemed guest to see him. The supervisor says goodbye to his friend, and he asks you what he can do for you. You tell him that you need to go into the park, and he gives you permission.

5.3.2 Evaluation

Since we are interested in evaluating the perception of the participants, we have included certain types of questions that measure different aspects of the interaction. (Do note, in the non-experiential conditions, the word 'you' is replaced by 'Bob', the name of the main character, in the questionnaires).

Questions related to the cultural aspects used to model the incident (these questions are different for each incident).

Critical Incident 1 (group membership) – Ranging from 'not at all' to 'very much'

- Did the people sitting at the table make you feel welcome in the bar?
- Did the barman make you feel a part of the group in the bar?
- Did the people sitting at the table make you feel a part of the group in the bar?

Critical Incident 2 (differences in status) – Ranging from 'much lower' to 'much higher'

- I felt that the park supervisor had a … social status than me;
- I felt that the guard had a … social status than me;
- I felt that the guard had a … social status than the park supervisor.

Questions related to the participant's perception of the appropriateness of their own behaviour, and that of the behaviour of other characters in the incident. – Ranging from 'not at all' to 'very much'

- How well did you and the [people sitting at the table/park supervisor] understand each other?
- Did the [people sitting at the table/park supervisor] seem to be offended by your behaviour?
- Do you think you behaved appropriately [in the bar/with the park supervisor]?
- Would you choose the same behaviour again if you were [in the bar/to ask the supervisor] again?
- Do you think the [people sitting at the table/park supervisor] responded appropriately?

Questions related to the affective relationship with the other characters, and the underlying reasons for their behaviour – Ranging from 'not at all' to 'very much'

- How trustworthy did the [people sitting at the table/park supervisor] appear to be?
- How friendly did the [people sitting at the table/park supervisor] appear to be?
- Do you think the [people sitting at the table/park supervisor] behaved the way they did because of their personality and character?
- Do you think the [people sitting at the table/park supervisor] behaved the way they did because in their culture they come from that is the way people behave?

5.3.3 Results

Participants

To attract a broad range of participants, we used social media and online experimental databases to gather participants. In total, 228 participants between 15 and 69 years old took part in our online study (142 females; mean age: 27.6; SD age: 11.5). There were 55 participants in Condition 1, 35 participants in Condition 2, 31 participants in Condition 3, 52 participants in Condition 4, and 55 participants in Condition 5. Participants were randomly assigned to these conditions (there was a higher dropout rate in condition 2 and 3; we believe this is due to the length of these conditions).

Comparison of conditions

To test for significant differences between story (1 and 2) and non-story conditions (3 and 4) and experiential (1 and 4) and non-experiential conditions (2 and 5) in participants' responses, Mann-Whitney U tests were conducted to find if there were significant differences in participants' responses as a function of the experiential and story components. Since there were many results, we summarize the findings in Table 5.2 and Table 5.3. More specific results, including the p-values, can be found in the following sections.

Table 5.2: Significant differences on the comparison between experiential versus non-experiential incidents and story versus non-story incidents for the first critical incident (table is written from the perspective of experiential and story conditions).

Question	Exp. (versus non-exp.)	Story (versus non-story)
How friendly did the people sitting at the table appear to be?	-	More
Did the barman make you feel a part of the group in the bar?	More[8]	More
Do you think the people sitting at the table behaved the way they did because of their personality and character?	-	Less
Do you think the people sitting at the table behaved the way they did because in their culture they come from that is the way people behave?	More	-
Did the people sitting at the table seem to be offended by your behaviour?	-	More
Do you think you behaved appropriately in the bar?	Less	-
Would you choose the same behaviour again if you were in the bar again?	-	Less
Do you think the people sitting at the table responded appropriately?	More	More

Table 5.3: Significant differences on the comparison between experiential versus non-experiential incidents and story versus non-story incidents for the second critical incident (table is written from the perspective of experiential and story conditions).

Question	Exp. (versus non-exp.)	Story (versus non-story)
I felt that the park supervisor had a [much higher/much lower] social status than me.	Higher	-
How trustworthy did the park supervisor appear to be?	-	More
Do you think you behaved appropriately with the park supervisor?	More	-
Would you choose the same behaviour again if you were interacting with the park supervisor again?	Less	Less

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8   This should be read as "The barman made the participant feel like a part of the group in the bar more in the experiential version than in the non-experiential version".

Story versus non-story

To test for differences between story (condition 1 and 2) and non-story conditions (condition 3 and 4) in participants' responses, Mann-Whitney U tests were conducted.

Critical incident 1

The participants of the story condition (condition 2, choice 1):
- found that the barman made them feel <u>more</u> a part of the group in the bar ($p = 0.005$, $U = 86.5$, $z = -2.83$, $r = -0.46$);
- thought the people at the table were <u>more</u> offended by their actions ($p < 0.001$, $U = 56$, $z = -3.92$, $r = -0.64$);
- would be <u>less</u> likely to choose the same behaviour again ($p = 0.006$, $U = 88$, $z = -2.94$, $r = -0.48$);

…than in the non-story condition (condition 1, choice 1).

The participants of the story condition (condition 2, choice 2):
- thought the people at the table were <u>friendlier</u> ($p = 0.023$, $U = 22.5$, $z = -2.36$, $r = -0.51$);
- thought the people at the table behaved the way they did because of their personality and character <u>less</u> ($p = 0.034$, $U = 24$, $z = -2.21$, $r = -0.48$);

…than in the non-story condition (condition 1, choice 2).

The participants of the story condition (condition 3):
- thought the people at the table acted <u>more</u> appropriate ($p = 0.014$, $U = 558$, $z = -2.46$, $r = -0.27$)

…than in the non-story condition (condition 4).

Critical incident 2

The participants of the story condition (condition 2, choice 1):
- found the park supervisor <u>more</u> trustworthy ($p = 0.028$, $U = 67.5$, $z = -2.36$, $r = -0.40$)

…than in the non-story condition (condition 1, choice 1).

The participants of the story condition (condition 3):
- were <u>less</u> likely to choose the same behaviour if they were to ask the supervisor again ($p = 0.005$, $U = 516$, $z = -2.83$, $r = -0.31$)

…than in the non-story condition (condition 4).

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Experiential versus non-experiential

To test for significant differences between experiential (condition 1 and 4) and non-experiential conditions (condition 2 and 5) in participants' responses, Mann-Whitney U tests were conducted.

Critical incident 1

The participants of the experiential condition (condition 1, choice 3):
- felt that the people at the table made them feel <u>more</u> a part of the group ($p = 0.025$, $U = 412.5$, $z = -2.24$, $r = -0.26$);
- thought that the characters sitting at the table behaved the way they did because in the culture they come from that's the way people behave <u>more</u> ($p = 0.024$, $U = 390$, $z = -2.26$, $r = -0.26$);
- thought that their behaviour in the bar was <u>less</u> appropriate ($p = 0.005$, $U = 355$, $z = -2.82$, $r = -0.33$);
- thought the people at the table acted <u>more</u> appropriate ($p = 0.001$, $U = 294$, $z = -3.43$, $r = -0.4$)

…than in the non-experiential condition (condition 4).

The participants of the experiential condition (condition 2, choice 3):
- felt that the people at the table made them feel <u>more</u> a part of the group ($p = 0.017$, $U = 294$, $z = -3.43$, $r = -0.4$);
- thought the people at the table acted <u>more</u> appropriate ($p = 0.031$, $U = 41$, $z = -2.27$, $r = -0.37$)

…than in the non-experiential condition (condition 3).

Critical incident 2

The participants of the experiential condition (condition 1, choice 2)
- felt that the park supervisor had a <u>higher</u> social status than their own ($p = 0.005$, $U = 143$, $z = -2.78$, $r = -0.35$)

…than in the non-experiential condition (condition 4).

The participants of the experiential condition (condition 2, choice 2):
- felt that the park supervisor had a <u>higher</u> social status than their own ($p = 0.011$, $U = 62$, $z = -2.71$, $r = -0.43$);
- thought that they behaved <u>more</u> appropriately with the park supervisor ($p = 0.028$, $U = 72$, $z = -2.23$, $r = -0.35$);
- were <u>less</u> likely to choose the same behaviour if they were to ask the supervisor again ($p = 0.003$, $U = 52$, $z = -2.92$, $r = -0.46$);

…than in the non-experiential condition (condition 3).

5.3.4 Discussion

As can be seen from the results, we were able to find differences between the experiential and non-experiential conditions and the story and non-story conditions. While it is hard to conclude the specific influence, we can see there is a difference in how participants perceive the behaviour of the characters in the scenario and how they perceive their own behaviour.

With regard to the behaviour of the characters in the scenario, participants found the characters to be more friendly and trustworthy, that they behaved more appropriate, made them feel more part of the group, and attributed their behaviour less to due to personality and character in the story conditions. Concerning the perception of their own behaviour, the participants considered the characters to be more offended by their actions, and were less likely to choose the same behaviour again in the story conditions.

With regard to the behaviour of the characters in the scenario, participants found that the characters made them feel more a part of the group, that they behaved more appropriate, and attributed their behaviour more to the culture they are from in the experiential conditions. Concerning the perception of their own behaviour, the participants considered their behaviour both less and more appropriate, and were less likely to choose the same behaviour again in the experiential conditions.

These results suggest that in the experiential and story conditions, participants are more likely to perceive the behaviour of the other characters in a more positive light, and are more critical of their own behaviour after the incident. A higher level of self-reflection is important for intercultural training, as this awareness is vital for recognizing whether there has been a conflict or misunderstanding, thus creating an entry-point into our intercultural learning framework (as defined in section 5.2).

5.4 Experiment 2

We used the results from the first experiment to design a digital prototype for culture-general training, henceforth called Traveller. Traveller was developed as part of the European project eCute, and its content is partly based on expanded versions of the incidents presented in the first experiment and a collection of new incidents. There is now also a larger back-story, giving the playing more context and an additional drive to progress through the incidents. Traveller includes so-called virtual agents that are able to make decisions autonomously depending on the context and the selected cultural profile (see Figure 5.2). There are many components in Traveller, for more information about Traveller as a whole, see previous work (Degens et al., 2013), but in this work we will only focus on the scenario of Traveller.

We found in the first experiment that experiential incidents with story components seem to lead to greater emotional involvement of users. This is why we have chosen to let the user take a role of a young person, who has to travel the world in search of his grand-

father's adventure, by interacting with agents from three different countries (with different cultural scripts).

There are two goals of this experiment: the first is to evaluate whether going through Traveller can lead to users attributing perceived differences in behaviour or interpretation to specific differences in culture, and the second is to evaluate if this awareness of differences may lead to users becoming less judgemental of inappropriate behaviours. These are two goals, one cognitive and one affective, from our intercultural learning framework described in section 5.2.

Figure 5.2: Example of an interaction with the virtual intelligent agents in a critical incident.

Usually, intercultural training includes a debriefing, helping the user to bridge this gap between the perception and interpretation of behaviour and the actual intentions behind that behaviour. Since our training tool is meant to be self-contained, it is not yet clear how such a debriefing should be structured. Therefore we are focusing on the tool as-is, to evaluate its effect on users.

To evaluate Traveller, we need to understand how Traveller affects the perception of users. We have done so by randomly assigning participants to one of two groups: the first group answered the evaluation questions without going through Traveller, and the other group went through Traveller and answered the evaluation questions afterwards. In the rest of this article, we will refer to the first group as the 'group without Traveller', and the second group as the 'group with Traveller'. This was chosen instead of a typical pre- and post-test experiment, because the questions would have notified the users of our experimental intent. We conducted the experiment at a university in Germany with international students and at two universities in the Netherlands with Dutch students.

Our expectations were that, since we are targeting basic elements of intercultural training, the international students would not show as much change with or without Traveller as the Dutch students would show. As such, we would expect there to be more differ-

ences between both groups in the condition without Traveller than in the condition with Traveller. We defined the hypotheses of this research as follows:

Hypothesis 1 (H1)

There will be no significant difference between the results of the test with and without Traveller for the international students.

Hypothesis 2 (H2)

The Dutch students will score significantly higher on the results from the test with Traveller than on the test without Traveller.

5.4.1 Modelling the Incidents

The user will go through three different countries within Traveller, and the people from each of these countries have a different 'culture'. By this, we mean that the characters from a country will perceive, interpret, and behave differently than characters from the other countries. The differences between the cultures are based on the three dimensions described in section 5.2: Individualism versus Collectivism, Masculinity versus Femininity, and Large Power Distance versus Smaller Power Distance.

There are two ways that we have instantiated the dimensions in Traveller. The first is through the behaviour of the virtual characters, with which users will interact during their travels, and the primary reason for a misunderstanding or conflict in each incident. Due to the scope of this article, we have chosen not to focus on the design of these virtual characters, and instead refer to upcoming work for more information (Degens, Endrass, et al., 2014; Mascarenhas et al., n.d.).

In short, the characters behave in a certain manner according to their cultural script. Individualistic agents focus more on the task at hand than personal relationships, and treat strangers differently from acquaintances. Masculine agents resolve conflicts by fighting them out, and are less likely to forgive a person who has behaved inappropriately. Large power distant agents consider people who are more powerful as more important than less powerful people are, and they are less likely to consult the opinion of subordinates.

In Table 5.4, we have described the cultural dimensions for each country within Traveller.

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Table 5.4: Cultural profiles of each country.

Country 1	Country 2	Country 3
Collectivistic	Individualistic	Individualistic
Masculine	Masculine	Feminine
Small Power Distance	Large Power Distance	Small Power Distance

First country

First incident

The user is lost, and needs directions to find his hotel, so he enters a bar in which two strangers are deep in conversation. This incident is about task orientation, does the user go directly to the characters in the back, to ask them for directions, or does he wait at the bar for the barman; and about the boundary between in and out group. In this case, the collectivistic characters are wary of strangers, and believe that they are not responsible for helping them out.

Second incident

The user needs permission to enter a wildlife park, and has to ask permission from a wildlife supervisor at a formal event. This incident is primarily about the effect of status on behaviour: do you approach the supervisor casually, and ask him for permission, or do you approach his assistant, who can introduce you to the supervisor. In this case, the small power distant characters do pay much attention to differences in status: the user should just walk up to the supervisor and ask him for help.

Third incident

The park supervisor accidentally knocks over an artefact. This incident is primarily about forgiving versus blaming: does the supervisor blame an employee of the museum, or does he accept responsibility. In this case, the masculine characters try to shift blame to others.

Second country

First incident

The user is on a train, and after a visit from a train conductor, discovers that he has bought a wrong ticket. This incident is primarily about forgiving versus blaming: is he blamed for not having a proper ticket, and told he has to pay a fine, or is he forgiven, and all is well. In this case, the masculine characters confront the user, and fine them for their behaviour.

Second incident

While the user is working in a restaurant, he will have to decide which customer to help first. This incident is primarily about the effect of status on behaviour and task orientation: does one help the elder people, who entered the restaurant last, before the younger people, who entered the bar first, or the other way around. In this case, the characters prefer that the elder people should be served first.

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Third country

First incident

While climbing a mountain, his guide has an accident, and is unable to continue. This incident is primarily about winning versus caring and task orientation: does the user leave the guide behind, and travel up the mountain alone, or does he take care of the guide. In this case, the character believes that it is more important to help those in need, instead of purely focusing on the goal.

Second incident

After trying to climb the mountain, the user is invited to a feast, and has to make a toast. This incident is primarily about the effect of status on behaviour and winning versus caring and task orientation: does he wait for the elder to make a toast or does he make a toast himself, and, if so, does he toast to success, or the people he has met in his adventures. In this case, he is expected to make a toast to his friends. Most of the cultural profiles used in the critical incidents are not yet validated. We have recently evaluated the first critical incident between participants from an individualistic and collectivistic culture, and the results suggest that the behaviour of the characters is representative of individualism versus collectivism (Mascarenhas et al., n.d.). In future work we will validate the cultural profiles used in the other incidents.

5.4.2 Evaluation

We are interested in evaluating if Traveller contributes to users attributing perceived differences in behaviour or interpretation to specific differences in culture and check if this awareness of differences may lead to users becoming less judgemental of inappropriate behaviours. To measure these elements, we have included two types of evaluation. The first focuses on questions involving knowledge about cultural differences, and the second focuses on questions involving affective aspects of situations in which a norm was violated. After these questions, participants were then also asked about their experiences in a short interview.

Cultural differences

During their run through Traveller, trainees are not told in abstract forms about differences due to cultures, but they do encounter them in the game. Encountering these differences could then lead to a stronger representation of cultural differences, as determined by a change in the probability/frequency that these behaviour could happen in real-life; a so-called availability heuristic.

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The following questions were rated on a scale from 0% to 100%:

- CQ1 - How often do people from other cultures focus on the task-at-hand rather than personal relations?
- CQ2 - How often do people from other cultures treat strangers differently from acquaintances?
- CQ3 - How often do people from other cultures resolve conflicts by fighting them out?
- CQ4 - How often do people from other cultures forgive a person who has just behaved inappropriately?
- CQ5 - How often do people from other cultures consider more powerful people as more important than less powerful people?
- CQ6 - How often do people from other cultures consult the opinion of subordinates?

These questions are based on the primary descriptors of the synthetic cultures that are also present in Traveller (for more information, see the synthetic culture descriptions (G. J. Hofstede et al., 2002)).

Norm violations

This part of the evaluation involved cultural vignettes, as developed by (Kappas, Tsankova, & Krumhuber, 2013). These vignettes, short stories about people interacting, use a norm violation as a probe to measure the affective stance of people towards 'deviant' behaviour. Since we did not find any significant results for this evaluation, we have not included additional information on the vignettes.

5.4.3 Results

Participants

In total, 137 participants between 17 and 28 years old took part in our study. There were two groups, international students from Jacobs University in Bremen, Germany (n = 74; 51 females; mean age 19.89; SD age: 1.60) and Dutch students from both Universities in Groningen, the Netherlands (*n* = 63; 20 females; mean age 21.89; SD age: 2.65). There were 43 students from Jacobs University in the 'without Traveller' condition and 31 students in the 'with Traveller' condition; there were 37 students from the Universities of Groningen in the 'without Traveller' condition and 26 students in the 'with Traveller' condition. Students joined voluntarily, and received a small monetary incentive for their effort. One participant was removed from the data due to the participant not belonging to the target group.

Cultural differences

International students

To test for significant differences between the results with and without Traveller for the international students, both the t-test (CQ1 and 6) and the Mann-Whitney U test (CQ2, 3, 4 and 5) were conducted. We found no significant differences.

Dutch students

To test for significant differences between the results with and without Traveller for the Dutch students, both the t-test (CQ1 and 6) and the Mann-Whitney U test (CQ2, 3, 4 and 5) were conducted. We only found a significant difference for CQ1 "How often do people from other cultures focus on the task at hand rather than personal relations?" Dutch participants rated this question significantly higher after having gone through Traveller condition (p: 0.020; mean without: 47.97, mean with: 58.31).

Comparison international and Dutch students

To test for significant differences between the international students from Jacobs University and the Dutch students on the test with and without Traveller, we used the Mann-Whitney U test. We found significant differences for both question CQ3 ($p = 0.005$; mean Dutch students: 36.35, mean international students 25.78; $U = 505.5$, $z = -2.82$, $r = -0.32a$) and CQ4 ($p = 0.006$; mean Dutch students: 42.03, mean international students: 30.35; $U = 509.5$, $z = -2.78$, $r = -0.31$) in the test without Traveller, but not in the test with Traveller.

5.4.4 Discussion

We did not find significant differences for students from the international university between the results from the test with and without Traveller, thus confirming hypothesis 1. We found a significant difference for one question between the results of the test with and without for the Dutch students for the questions about cultural differences, thus partly confirming hypothesis 2.

When comparing the international students with the Dutch students we found a significant difference for two questions for the results from the test without Traveller. These questions had to do with 'resolving conflicts by fighting them out' and 'forgiving a person for behaving inappropriately'. This difference between the two groups was not present in the test with Traveller, which seems to suggest that the groups were more homogeneous after going through Traveller.

While the lack of significant results on the comparison between the test with Traveller and the test without may seem to imply that the tool was not effective, we did find some interesting results in the interviews conducted after the experiment. When asked about the goal of the experiment, many of the participants responded that we wanted to see how people would respond in certain social and cultural situations. It was however quite difficult for them to link the abstract concepts in the questions about cultural differences to

specific instances of behaviour that happened during Traveller. After explaining the link between these two, participants became aware of other instances of behaviour: "Oh! That would explain why the people in the bar were so distant!" This a-ha moment was also present in other participants "I probably should have been more polite to the elderly man"; "I feel as if I'm now more conscious about behaving appropriately in social situations".

One major problem that we discovered in the interview is that the transition between the different cultures was not noticed by a large majority of the participants. They were aware of some visual differences, such as palm trees in one country, and a hut in another, but they felt that the behaviour of the characters did not change noticeably. This would imply that different cultures were not noticeable enough, possibly requiring a larger amount of incidents alongside clear transitions between the countries.

5.5 General Discussion and Conclusion

In this article, we take the first steps to creating a digital culture-general training tool using critical incidents. In the theoretical background section we identified a set of requirements, the most important being that users should be aware that a misunderstanding or conflict has occurred, and that they should relate these misunderstandings to the nature of differences in behaviour and interpretation across cultures.

Based on these aims, we established and discussed relevant theories, which we then used to create two prototypes, which were evaluated in two experiments. We found in the first experiment that an experiential approach, embedded in a story, led to participants perceiving the behaviour of the characters in a more positive light, and being more critical of their own behaviour after the incident. This may be due to participants feeling more involved in the interaction and thus perceiving their own behaviour and that of others similarly to real-life behaviour. This is important, because if one is to learn from misunderstandings in intercultural contexts, one should feel like they are participating in an actual interaction.

In the second experiment, our results suggest that our training tool could lead to users being more aware of cultural differences. While the quantitative data only shows a significant improvement for one aspect of cultural differences, we found in interviews afterwards that, with a small explanation of these aspects, participants had a greater understanding of cultural differences as a whole.

While the results show that we have created a good basis for a culture-general training tool, there are some limitations to the current version of our tool and method.

The first of which is the validation of individual incidents. In the first experiment, we looked at the perception of individual incidents, but in the second experiment, we only evaluated the effect of the entire collection of critical incidents. We did so to evaluate whether our training tool can help trainees progress through our intercultural learning framework in Figure 5.1, which is more likely to happen if trainees encounter multiple

interactions. For future work, it is important to check the effect of each incident in terms of perception and presence of misunderstandings (see our previous work on how such incidents should be evaluated (Degens, Endrass, et al., 2014)).

The second of which is the lack of a debriefing in the current setup. By combining quantitative and qualitative data, we found that users are able to relate cultural differences to the specific actions of the characters, if primarily they are told about the specific differences. This shows the need for a debriefing, helping the user to translate from emotion to cognition. It might also be that because the participants were not aware they were going through an intercultural training tool, we did not find the expected results. For future work, we will evaluate the effect of the tool when embedded as part of a larger intercultural training package, including a debriefing.

The third of is which is the evaluation used. The questions that we have used are not validated, and are not without their problems. These problems are particularly related to measuring the amount of knowledge that people have of cultural differences. This is difficult, as the behaviour may occur in some cultures, but not in others.

This study has found that digital tools can be used to make users aware of conflicts and misunderstandings, and that by interacting with virtual characters in such a tool users become more aware of cultural differences. Future work will continue the current line of research to validate certain parts of the tool.

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Chapter 6

Discussions and Conclusions

"So tell me,
since it makes no factual difference to you
and you can't prove the question either way,
which story do you prefer?"
Yann Martel

The main aim of this research was to design an artefact, namely a digital agent-based culture-general training tool. Through this artefact, we hoped to contribute to solving an important societal problem: helping young adults to deal with misunderstandings and conflicts due to differences in culture. To help structure the design process, we formulated five design research questions:

Design Research Question 1 – Which concepts are required to describe the design of a digital culture-general training tool involving agents that show culturally varying behaviour?

Design Research Question 2 – Can we use theories of culture to create scripted scenarios in which virtual characters behave appropriately for a given culture?

Design Research Question 3 - Can we identify requirements for socio-cultural agents that can help them to make sense of their social world?

Design Research Question 4 – Can we create intelligent agents that can vary their behaviour depending on the culture to be simulated?

Design Research Question 5 – Can we create critical incidents, involving intelligent agents that show appropriate behaviour for given cultures, through which potential trainees become more sensitive to and knowledgeable about differences across cultures?

Besides creating and evaluating a proof-of-concept application, we also wanted to contribute to the knowledge base in the two ways. First, we wanted to create design artefacts that can be used by other researchers and practitioners to design similar tools in a more systematic manner. Second, we wanted to ensure that these design artefacts are generalizable, so that they can be adapted for use in other applications.

In this chapter, we will first describe the answers to the design research questions based on the work described in the previous chapters. Second, we will explain how these answers contribute to the knowledge base in the shape of design artefacts. This will involve a description of the relevant artefacts, and a discussion on their use in similar and different applications. Third, we aim to discuss the limitations of our work, in terms of generalizability and validity. Lastly, we will discuss some directions for future work.

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6.1 Outcomes to the Research Questions

6.1.1 Design Research Question 1

Which concepts are required to describe the design of a digital culture-general training tool involving agents that show culturally varying behaviour?

Throughout this work, we have discussed many concepts that are important in two fields: the modelling of cultural behaviour in agents, and the creation of an educational scenario for culture-general training. To make these concepts more visible and insightful to researchers and practitioners from those fields, we have compiled a list of key concepts. This list can be found in the glossary of this thesis.

There are two types of concepts: those that already existed in the knowledge base, which we derived from theory, and those that were not yet present in the knowledge base, which we created through an integration of relevant theories. The former consists of terms such as *moral circles*, while the latter consists of terms such as *moral circle centrality*. The selection of concepts was based on their practical use in creating socio-cultural agents and educational scenarios for intercultural training.

Throughout this work, we were also concerned with creating operable definitions of theoretical concepts. This was required to ensure that these concepts play a role in how the socio-cultural agents interpret and behave during interactions. An example of this is the instantiation of *cultural meta-norms*, a theoretical concept, into *cultural modifiers*, an operable concept. We will discuss this instantiation in more detail when we discuss the models that we have used in this work (see section 6.2.2).

6.1.2 Design Research Question 2

Can we use theories of culture to create scripted scenarios in which virtual characters behave appropriately for a given culture?

This question is answered in Chapter 2. In this chapter, we show that theories of culture, in this case, Hofstede's dimensional model (G. Hofstede et al., 2010), can indeed be used to create scripted scenarios in which virtual characters show culturally varying behaviour representative of real-life cultural differences.

We took inspiration from one dimension of culture, masculinity versus femininity[9], to create four scripted scenarios, each involving an interaction between a virtual character

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9   This dimension does not refer to gender or gender differences. For more information on this dimension, see Chapter 2.

playing a student and a virtual character playing a professor. In these scenarios, the characters either follow a *Mascu* (extreme masculinity) or *Femi* (extreme femininity) script (G. J. Hofstede & Pedersen, 1999), thus creating the following scenarios: 1) *Mascu* professor and *Mascu* student; 2) *Mascu* professor and *Femi* student; 3) *Femi* professor and *Mascu* student; and 4) *Femi* professor and *Femi* student. In these scenarios, the student needs an extension to a deadline for an assignment from the professor. The *Mascu* student needed that extension because she wanted to perform better; the *Femi* student needed that extension because she had to attend a family event.

To ensure that the behaviours of the *Mascu* and *Femi* characters were considered appropriate by people from countries that vary on the masculinity versus femininity dimension, we conducted an evaluation consisting primarily of people from four different cultures. Participants had to view each scenario and judge whether they considered the behaviour of each character to be appropriate. The participants were classified according to the score of their country of origin on the masculinity versus femininity dimension, to see if participants from countries that score high on masculinity considered the *Mascu* characters to be more appropriate than the *Femi* characters (and vice versa).

We did not find the expected differences, but we did find a significant difference between participants from individualistic and collectivistic countries; the underlying reason for the interaction of the *Femi* student seemed to be more related to the individualism versus collectivism dimension than to the masculinity versus femininity dimension (due to the reference to a family event). Based on the comments we then added two scenarios with a different underlying reason for the *Femi* student that we considered to be less related to the individualism versus collectivism dimension, i.e. the student needed an extension because her computer stopped working, and conducted another evaluation consisting primarily of people from four different cultures.

The results from the second evaluation seemed to suggest that the scenarios target the masculinity versus femininity dimension more than the old scenarios. We also found significant differences in the perception of the appropriateness of the agents' behaviour between the new and old scenarios, even though we had considered the changes in behaviour to be minor.

The results show that the dimensions of culture can be used to generate scenarios in which virtual characters show culturally varying behaviour, but that extensive (pre)testing is required to ensure that the designer's interpretation of the theories of culture aligns with the user's interpretation of the virtual character's behaviour.

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6.1.3 Design Research Question 3

Can we identify requirements for socio-cultural agents that can help them to make sense of their social world?

This question is answered in Chapter 3. In this chapter, we described a model that can be used in the design of socio-cultural agents to help them make sense of the social world (see Figure 3.1). This model was constructed through an analysis of relevant theories on culture, psychology, and social interaction. It helps to bridge the relationship between more abstract concepts, such as culture, and more specific concepts, such as behaviour. We shall discuss this model in more detail in 6.2.2.

Based on the model, we have posited a set of requirements for socio-cultural agents. The first three requirements define the basic elements of social interaction that are necessary for the agents to interpret and behave appropriately during interactions. It is important that they are able to decode the underlying symbolic functions of a ritual (and that the function may differ depending on those involved and the location of the interaction). A socio-cultural agent should be able to understand the difference between another agent wanting to become a friend, and another agent wanting to be polite.

1. Socio-cultural agents need to be aware of their context, and whether they are taking part in a ritual with other participants;
2. Socio-cultural agents need be able to decode the symbolic function of a perceived ritual;
3. The symbolic function of a ritual needs to be able to change depending on the people involved (participants) and the environment (context);

The next five requirements define additional elements of social interaction that are necessary for socio-cultural agents to interpret and behave appropriately in different groups.

First, the agents need some way to differentiate between groups, which we have instantiated as moral circles, and, if there are people who belong to multiple groups or, if multiple groups are present, determine which group should receive priority in a specific context. For example, imagine a close family member visiting you at work; some people, depending on where they are from, might not treat you the same way at work, as they would do at home.

Second, the agents need some way to differentiate between group members. This is done through the concept of relational primitives, which may vary per individual. Consider for example the difference between how you would treat a boss at work that has always treated you with respect, and how you would treat a boss that always makes you work through the weekend. This of course also depends on where you are from; there may actually be no difference in how you treat these two bosses.

Third, the agents need some way to determine what is appropriate and what is not.

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This is done through the concept of social norms, which may vary per moral circle and per the relational primitives of those involved in an interaction. For example, imagine that you have a problem with the management style of your boss; some people, depending on where they are from, would consider it appropriate to tell the boss their opinion at work (or even in public), while others would consider it appropriate to do so after work, in an informal setting, such as a bar.

4. Socio-cultural agents need to categorize each individual into moral circles;
5. Socio-cultural agents need to be able to differentiate between types of moral circles; the moral circle with the highest centrality should receive priority when multiple moral circles are salient;
6. Socio-cultural agents need to be able to infer the status of characters, either through public variables, the observation and interpretation of symbols or through information gained from previous interactions;
7. Appropriate or inappropriate behaviour of other agents should lead to a respective change in their moral circle reputation;
8. Socio-cultural agents should determine which social norms are applicable, and when multiple social norms are applicable at the same time, which take precedence. This process should be dependent on the salient moral circles, and the relational primitives of the participants;

The last requirement defines an important element necessary for socio-cultural agents to interpret and behave appropriately with agents from different cultures, i.e. cultural meta-norms. In the previous three examples, we have already shown that people from different cultures may exhibit different interpretations and behaviours regarding the importance of moral circles, social norms, and relational primitives.

9. Cultural meta-norms should be used to create weighting and salience mechanisms for moral circles, social norms, and relational primitives.

6.1.4 Design Research Question 4

Can we create intelligent agents that can vary their behaviour depending on the culture to be simulated?

This question is answered in Chapter 4. In this chapter, we describe the creation of intelligent agents that can vary their behaviour depending on the culture to be simulated.

To help the agents determine how they should behave during an interaction, we use Kemper's concept of status, which represents "the acts or means by which the scalar standing, worth, prestige, honour of a person or social position is conveyed in interaction" (Kemper, 2011). This was later referred to as social importance, as part of the Social Importance Dynamics (SID) model, to avoid confusion with other connotations of the word status (Mascarenhas et al., 2013). We will discuss this model in more detail in 6.2.2.

Social importance can be used to "represent how much we are willing to act in the interest of another social entity, taking into account their needs and wishes above our own" (Mascarenhas et al., n.d.). By having each individual try to optimize their social importance, by attributing, claiming, and conferring social importance, we can create believable social interactions (for more information on this process, see Chapter 4).

We describe the integration of social importance dynamics into an affective agent architecture FAtiMA (Dias & Paiva, 2005) to create intelligent agents that attribute, claim and confer social importance. To ensure that agents act out culturally varying behaviour, we used cultural modifiers to change the strength of attributions, claims, and conferrals, following the line of cultural meta-norms from Chapter 3.

The model and the agents were evaluated through a case study approach. In this case study, we operationalised one dimension of culture, individualism versus collectivism, to create intelligent agents that show behaviour that is representative of the extremes of that dimension, i.e. individualistic and collectivistic agents. Participants from the Netherlands (a highly individualistic country) or from Portugal (a rather collectivistic country) then had to interact with either individualistic or collectivistic agents and judge their behaviour. We found that the Portuguese participants perceived the behaviour of the collectivistic agents as more appropriate than the Dutch participants did. We did not find the reverse, but we believe that this is due to there being too few socially inappropriate actions in the scenario with the individualistic agents.

The results suggest that it is possible to create intelligent agents that can act out appropriate behaviour for a given culture.

6.1.5 Design Research Question 5

Can we create critical incidents, involving intelligent agents that show appropriate behaviour for given cultures, through which potential trainees become more sensitive to and knowledgeable about differences across cultures?

This question is answered in Chapter 5. In this chapter, we focus on applying different methods of intercultural training, i.e. experiential versus didactic approaches and story versus non-story approaches, in the design of a digital culture-general training tool. Based on theories from intercultural training and intercultural psychology, and an intercultural learning framework, we created five similar scripted scenarios, involving two misunderstandings due to culture, each embodying a different method of intercultural training. Before we could evaluate if the scenarios are able to make trainees more sensitive to and knowledgeable about differences across cultures, we first needed to ensure that they are aware of the misunderstandings that happen in these scenarios.

To evaluate which scenario was more effective in making people aware of misunderstandings, we conducted a between-group experiment with people from a wide range of cultures. The results suggest that by going through experiential and story-based scenar-

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ios participants became more critical of their own behaviour than non-experiential and non-story-based scenarios. This is likely due to the participants feeling more emotionally involved in the interactions and thus more likely to experience the misunderstandings similarly to how they would in real life.

Based on these results, we then created seven critical incidents using the affective agent-based architecture FAtiMA and the intelligent agents from design research question 4. These incidents were part of a training tool, i.e. Traveller, in which trainees can travel to three different countries and interact with intelligent agents that interpret and behave differently depending on their cultural script. The values of three dimensions of culture (power distance, masculinity versus femininity, and individualism versus collectivism) can be varied to change the perception, interpretation, and behaviour of the agents. As such, trainees will have different experiences when going through the training tool multiple times.

Throughout their journey, the trainees may get into misunderstandings due to differences in culture and perceive how agents 'from different cultures' will react to similar problems. The reasons for the misunderstandings in the critical incidents were also inspired by three dimensions of culture.

To ensure that the critical incidents lead to users attributing perceived differences in behaviour to differences in culture, and to them becoming less judgemental of inappropriate behaviours by people from different cultures, we evaluated the tool with participants from an international university and participants from a university with primarily Dutch students. We assumed that the tool would have little effect on the international students and a significant effect on the Dutch students (as they have less experience in dealing with students from countries other than their own). We found that the tool had an effect on the Dutch students, i.e. they were significantly more aware of one aspect of cultural differences after going through Traveller than without going through Traveller. We did not find any results concerning an increased sensitivity in the participants.

The results suggest that it is possible to create agent-based critical incidents to make potential trainees more knowledgeable about differences across cultures.

6.2 Knowledge Contributions

Before we can discuss the contributions to the knowledge base, we first need to discuss the nature of a design contribution. After that, we will discuss the contributions in terms of the design artefacts that have been created as part of this work, and explain their use. The limitations of these contributions will be discussed in 6.3.

6.2.1 The Nature of a Design Contribution

In the introduction to this work, we talked about the rigor cycle as an important part of the design process. There were two important aspects to this cycle: what we take

from the knowledge base to ground and inform our design choices, and the addition of new items of knowledge to the knowledge base.

An important part of science is the contribution to knowledge (Gregor & Hevner, 2013; Straub, Ang, & Evaristo, 1994). If a research project does not contribute any new knowledge, then that project will be of little use to others. Gregor and Hevner (2013) explain that the contributions of design science do not take the shape of comprehensive theories, but rather take the shape of design artefacts, such as implementations, and abstract artefacts, such as models. Österle et al. (2010) describe four concrete outputs: constructs (or concepts), models, methods, and instantiations (or implementations).

Gregor and Hevner (2013) identify different types of knowledge contributions, i.e. improvement, invention, routine design, and exaptation, and their potential research contributions, as can be seen in Figure 6.1. These knowledge contributions help to determine the relevance of certain design outputs. For instance, limited knowledge will be gained by re-applying the same implementation to the same problem.
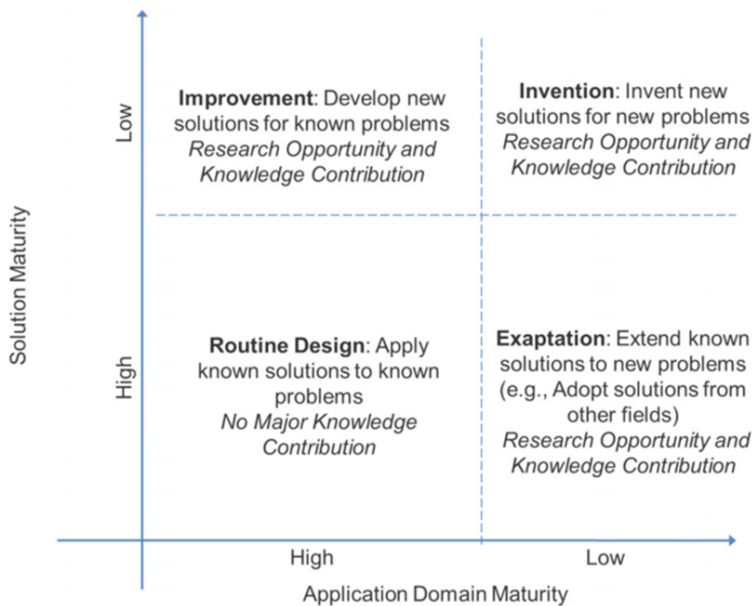

Figure 6.1: Gregor and Hevner's DSR Knowledge Contribution Framework (Gregor & Hevner, 2013).

In most of our work, we have primarily been working within the *invention* quadrant of Figure 6.1. There were no pre-existing digital culture-general training tools using virtual intelligent agents and there was little information on how to systematically apply model-driven approaches to abstract from theoretical models of cultural differences to establish

the behaviour of these agents. This meant we had to invent a solution for a new problem and we could not use existing approaches to do so. As such, our work is explorative in nature, and the outputs are thus work-in-progress; instead of adding fully mature outputs to the knowledge base, we only take the first steps.

Gregor and Hevner (2013) do mention that it is not yet clear how the design artefacts can be assessed as to degrees of contribution. We believe that the best way to discuss the degree of contribution is by looking at two aspects: validation and generalizability. Validation requires that design artefacts, such as the designed concepts and models, be user-tested through implementations. Generalization requires that the models and methods that have been created can be applied in different applications.

Looking back at our research questions, we can specify our knowledge contributions in terms of the following design artefacts.

6.2.2 Design Artefacts

Concepts

This list of concepts is intended as a starting point for a coherent vocabulary for a relatively new interdisciplinary field of study, enabling communication between contributing researchers from various disciplines. It is built from non-ambiguous concepts from various disciplines, and newly created concepts that needed to be properly defined for the field to mature.

This vocabulary contributes to the knowledge base in two ways. First, it creates a single point of reference for important concepts relevant to designing socio-cultural agents and the scenarios they 'live' in. Second, it provides a coherent set of definitions for words that may hold different connotations for researchers from other fields and thus helps to establish a common ground between those researchers.

Models

In the introduction, we described the need for two different parts to formalizing the process of generating culturally varying behaviour in intelligent agents: the conceptual social world they live in and an operable way for them to navigate through that world. These two parts are described respectively in the *conceptual model for socio-cultural agents* and the *Social Importance Dynamics model using cultural modifiers*.

These models were created from different perspectives. The former was primarily created from the perspective of theory and aims to highlight the concepts that should influence the interpretation and behaviour of socio-cultural agents. The latter was created from the perspective of practice, i.e. an agent-based architecture, and aims to describe an operable way for agents to interact with each other and with users.

In this section we will discuss the models in depth, explain how they were combined, and what the models can be used for.

The conceptual model for socio-cultural agents

The conceptual model for socio-cultural agents describes important concepts of social interactions based on theories from sociology and psychology (see Figure 3.1 for the model). This model is rooted in the necessity of incorporating both social components, such as pre-existing relationships, and cultural components, such as attributing more importance to people with a higher status. It is comprised of three layers: the interaction level, which consists of elements that may vary per interaction, the group level, which consists of elements that may vary per group, and the society level, which consists of elements that may vary per society. These levels range from being more specific, and thus more visible, to more abstract, and thus less visible.

On the interaction level, we can identify three important concepts: the ritual, the participants, and the environment. The ritual is primarily concerned with the symbolic aspects of an interaction, such as an individual giving another individual some money so he can buy lunch. The meaning of this ritual may change depending on the participants, i.e. those who participate in the ritual, and the environment, i.e. the physical location of the ritual (imagine two people giving each other money in a dark alley).

On the group level, we can identify three important concepts: the moral circle, the social norms, and the relational primitives. Moral circles help to divide between people who are worthy of moral consideration, and those who are not. Since those worthy of moral consideration are not always equally important, we use the concept of moral circle centrality to differentiate between moral circles based on how much the people in those moral circles matter to an individual. For example, depending on where you are from, a moral circle of friends may be more important to you than a moral circle of work colleagues. Changes in moral circles are mediated through rituals; for instance, a colleague may become a friend after a few conversations, or after many years.

Based on the salient moral circles, different social norms may be active. Social norms are guides to short-term behaviour and help the agents to select certain actions over others depending on the context. Relational primitives, such as moral circle status and reputation, can help to discriminate between moral circle members. For example, depending on where you are from, you may treat an elderly person with more respect, for instance by letting them sit down on the bus, than a younger person.

On the society level, we can identify one important concept: the cultural meta-norms. A cultural meta-norm is a rule that, based on the cultural script of an intelligent agent and the context, changes the centrality of moral circles, the salience of social norms, and the weighting of relational primitives (or social importance, as can be seen in Chapter 4).

Imagine a situation that contains all three elements: Peter is celebrating his birthday with a group of friends and people from his work (different moral circles). His boss has also decided to attend, even though he is a very busy man (moral circle status). Where Peter is from, it is not appropriate to ignore your superiors, even at an informal event such as a birthday party (social norm). As such, he spends a lot of time talking (conferring im-

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portance) to his boss, instead of to his family or his friends. Those from his culture would understand the situation, but others might consider it a strange event.

The Social Importance Dynamics model including cultural modifiers

In Chapter 4, we discuss the concept of social importance, and the accompanying SID model that can be used to describe the flow of social interaction. The model can be used to create believable social interactions between agents (Mascarenhas et al., 2013).

The model is comprised of three different elements: social importance attributions, claims, and conferrals. Social importance attribution occurs when someone is first seen or encountered, and may be updated depending on new information gained during an interaction; for example, you discover that a stranger works at the same company as you do, which may impact the amount of social importance that you attribute to him or her. Social importance claims and conferrals are always active during interactions, as they help to decide appropriate behaviours; asking a friend to give up an important deadline to go out with you for a drink, might not be considered an appropriate request by that friend. See Figure 4.2 to see how these elements relate to the agent-based architecture.

Social importance attribution consists of the target of the attribution, the activation criteria, and the amount of social importance that is gained or lost. The activation criteria are based on relational properties of the target, e.g. is he a friend, is he a stranger, etc.

Social importance conferrals consists of the contexts for which the conferral is considered appropriate, the action that can be considered a conferral, the target of the conferral, and the amount of social importance conferred by that action.

Social importance claims consist of the action that can be considered a claim, the target of the claim, and the amount of social importance that is needed for the claim to be successful.

The concept of cultural modifiers was added to the model, to ensure that the amount of social importance that is attributed, claimed, and conferred could vary depending on the culture that is to be modelled. The same set of actions would thus have different values of social importance for people from different cultures. This allows us to systematically describe interactions between socio-cultural agents, as can be seen in Chapter 4.

Combining the models

The first steps have been taken to integrate the conceptual model for *socio-cultural agents* and the *SID model*, but, as of yet, not all elements are explicitly integrated.

On an interaction level, the ritual is instantiated as the flow of claims and conferrals during an interaction. Both the participants present and the environment that the ritual takes place in help to determine which claims and conferrals are relevant for that ritual.

On a group level, we have implicitly instantiated moral circles by attributing different levels of social importance to in and out-group members depending on the cultural script of an agent. Agents are, as of yet, unable to reason about this moral circle member-

ship or change it; the membership of each agent is predefined by the designer.

Social norms are instantiated as the amount of social importance that is required for claims and conferrals to be considered appropriate in a certain context. The two relational primitives, moral circle status and reputation, are also instantiated. Moral circle status is instantiated through the attribution of different levels of social importance to other individuals depending on their relative place in the hierarchy, e.g. an elderly man might receive a higher social importance than a young man would. Agents can also lose social importance if they act out inappropriate claims or conferrals. This represents the dynamics of moral circle reputation, e.g. if the user keeps acting inappropriately, he or she will keep losing social importance.

On a society level, the cultural meta-norms are instantiated as cultural modifiers that vary the amount of social importance that is attributed to an individual, as well as the amount of social importance that is required for claims and conferrals to be considered appropriate. This will influence the flow of the ritual, particularly when the participants of a ritual are from different cultures.

Using the models

The models are an important outcome that can be used to systematize the process of interaction between agents in different contexts or even different applications. They can be used for a number of important purposes.

First, they may be used to analyse misunderstandings and conflicts in a systematic manner. This will lead to a greater understanding on the levels of analysis involved during interactions. For instance, a misunderstanding regarding moral circle membership may be due to differences in culture. However, such a misunderstanding may also occur with people from the same culture.

Second, they may be used to generate critical incidents in a systematic manner, by establishing the concepts that are present in and relevant to an interaction between users and intelligent agents. For instance, when making a culture-specific training scenario, a designer could try and instantiate the concepts from the model for a specific context (e.g. who is part of which moral circle and which social norms are currently active). Doing so, the designer could then evaluate these scenarios with people from a specific culture, to see if the scenario is plausible for people from that culture.

Third, they may be used to describe or generate the flow of interaction between users and agents in a systematic manner. When generating a scenario that involves a cultural misunderstanding, one can then describe the differences in terms of social importance attribution, claims, and conferrals, to better understand or model the misunderstandings.

Fourth, they may be used to determine the scope of an agent-based system, i.e. what would need to be incorporated into the design of an agent-based architecture. The researchers would need to define the elements that are active in the mind of an agent that can be used to influence their perception, interpretation, and behaviour. This may be use-

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ful for researchers or practitioners creating socio-cultural agents.

The models are important outcomes that can be used to systematize the process of making intelligent agents that show culturally varying behaviour in different contexts and applications.

Methods

An important part of this work has been using theories of culture to create culturally varying behaviour in virtual agents. While similar research has been conducted before in applying model-driven methods to determine the behaviour of intelligent agents (Mascarenhas et al., 2010; Solomon, Lent, Core, Paul, & Rosenberg, 2008), there is not yet a systematic method to do so. This lack of systemization is due to the different levels of analysis involved when trying to make a computation model of culture; to instantiate theoretical concepts in an operable manner, one would need to understand how these concepts apply to specific situations.

This requires the researcher to answer a broad range of questions. Which parts of behaviour can be classified as culture? What exactly can be characterized as behaviour representative of extreme femininity? What is power, and how does it show in different contexts? In addition, we have also seen, in Chapter 2, that the underlying cultural background of both designers and users may influence the design and interpretation of culturally varying behaviour in virtual characters.

To help deal with these problems, we discussed a model in Chapter 2 based on Johari windows (Luft, 1970) which relates the intentions of the designer to the perceptions of the user. We then posited a set of recommendations for the evaluation of virtual agents, and indirectly the scenarios they are part of, to ensure that they behave appropriately for a given culture. It is important to…

1. … test whether participants from different nationalities perceive the behaviour of virtual characters with different cultural scripts differently;
2. … test hypotheses with a wide variety of cultures represented, instead of a large number of participants from a limited variety of cultures;
3. … include open-ended questions in user tests to discover hidden-user-context issues that may not become apparent from closed questions;
4. … test whether the intended appropriate culture-specific behaviour is actually considered to be appropriate by the target audience;
5. … test whether different elements of the content and context, in particular those inconspicuous to the designer's mind, affect the users' perception of the scenario as a whole.

These recommendations can be used to evaluate both the culturally varying behaviour of the agents and the educational scenarios that incorporate these agents. These results in turn will help to gain a greater understanding of how the theories of culture should be interpreted and used.

Implementations

Based on the concepts, models, and methods presented above, we have collaborated with others researchers in the eCute project to create a set of implementations. An updated version of the agent-based architecture FAtiMA[10], incorporating the social importance dynamics and cultural modifiers, and the digital culture-general training tool Traveller[11], incorporating the scenarios presented in Chapter 4 and Chapter 5, are available for download. Both are open source, and can be edited for use in other contexts or to model other aspects of culture.

6.3 Limitations

Limitations of our work primarily have to do with the state, validity, and generalizability of our design artefacts.

Concerning the models, we can identify two important limitations:

The first is that some of the elements of the models are not yet fully formalized (and thus not yet evaluated). In 6.2.2, we describe the relationship between the models that we have used in this work. We show that some of the elements from the conceptual model for socio-cultural agents are instantiated in the behaviour of the agents, such as the cultural meta-norms, but that others are not yet fully instantiated, such as changes in moral circle membership. These elements are thus still contested; it is not yet clear how they should be implemented.

Since our critical incidents were short, and trainees did not interact with the same agents in multiple critical incidents, we did not need to instantiate these elements. However, we do feel that this lack of instantiation is an important limitation. Agents are currently unable to reason about their membership to moral circles; they cannot actively strive to become a member of a moral circle, nor can they be removed from one. We feel this is an important part of social interaction, and is required to further the field.

The second is that there are aspects that are not yet present in our models. At the moment we have only instantiated three dimensions of culture, i.e. power distance, masculinity versus femininity, and individualism versus collectivism, and Kemper's concept of status (2011) into the behaviour of the agents. While the concepts that were instantiated have served our purposes, adding these missing elements will allow us to show cultural differences in a wide range of settings.

Concerning the method, we can also identify five important limitations:

The first is that users from a wide range of cultural backgrounds might have misinterpreted or not perceived intended design choices due to cultural differences in perception and interpretation (as was found in Chapter 2). The experiments described in Chapter 4 and Chapter 5 have been conducted with significant numbers of people from only a few

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10   http://ecute.eu/downloads/software/fatima/
11   http://ecute.eu/traveller/download

countries, and while those results were positive, additional experiments, with people from a wider range of cultures, are required to ensure that the results also hold for people from other cultures.

The second has to do with the instantiation of theoretical concepts of culture in the behaviour of intelligent agents and in intercultural training scenarios. We saw in Chapter 2 that the cultural background of the designer influences the interpretation of the design of the characters and the scenarios. To help this process, we have defined concepts and models that help to systematize the design process. However, it may be that these models are based on incorrect assumptions. Expert reviews or additional user testing may be needed to ensure the validity of the models.

The third has to do primarily with the evaluation. As can be seen from Chapter 3, making one small change in the design of the tool may invalidate previous validation results. There is also the issue of the whole being greater than the sum of its parts; the combination of two critical incidents may create a different experience than each one individually. Continuous testing throughout the design of the tool would have been a good option to mediate this problem. However, testing in such a fashion is very expensive in terms of time and costs. The individual elements of the implementation should thus be evaluated on their own to understand their impact on the entire implementation.

The fourth has to do with the instantiation of the models for specific contexts. For example, the values for the social importance were selected based on the interpretation of the theories of culture and expert knowledge. As such, it may be difficult for other researchers and practitioners to parameterize our models and find similar results. Additional user testing and expert reviews may help to ensure that the values are accurate.

The fifth is that the values for the social importance attribution, claims, and conferrals, together with the values for the cultural modifiers, are currently predefined based on the synthetic culture descriptions described in Hofstede's work (G. J. Hofstede et al., 2002). For now, we have only focused on ensuring that the values of these actions were appropriate relative to each other, instead of defining the absolute values required for the actions to be considered appropriate independent of other actions. In future work, such values would need to be validated to help ensure that the behaviours are appropriate.

6.4 Future work

In our work, we have taken the first steps in the design of a digital culture-general training tool. We believe that our approach was effective and represents a viable way to create agent-based intercultural training tools that can be used by people from a wide range of cultures. In particular, we feel that this is due to the integration of both theory and practice, by focusing on minimising the gap between design assumptions and the interpretation of users, and through the creation of concepts and models that can be used to expand the repertoire of the agents and to create new incidents.

We can thus recommend that future researchers follow in our footsteps by further expanding on the concepts, models, methods, and implementations described in this work. We do have some ideas and suggestions for future work.

The first is regarding the importance of trainees being engaged in the interactions with the virtual characters. If trainees are engaged, then it is likely that they will experience misunderstandings and conflicts in a similar manner as in real-life. To ensure that they are engaged, future work should focus on understanding how such a training tool can be designed to ensure the emotional involvement of trainees.

The second is the importance of further structuring the process of using model-driven approaches to generate socio-cultural behaviour. How can we systematically create specific behaviours from theories from sociology and psychology in such a way that other researchers can follow the same approach? More specifically, how can we ensure that the specific values for social importance are defined in such a way that other researchers would find the same results as we have?

The third is the importance of using our design outputs in different applications and/or with different people. Are the concepts and models presented in this work sufficient for use in other applications or fields? Would we get the same results if we evaluated the implementations with people from other cultures?

As for our parting words, we hope that our work inspires those who follow and will help them to create artefacts with which we can better not only our own lives, but also those of others.

"The Road goes ever on and on
Out from the door where it began.
Now far ahead the Road has gone.
Let others follow, if they can!
Let them a journey new begin.
But I at last with weary feet
Will turn towards the lighted inn,
My evening-rest and sleep to meet."

J.R.R. Tolkien

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Summary

People from all over the world must live and work together in today's society. Such integration is not always a smooth process, and interactions with people from other cultures may lead to misunderstandings or even outright conflicts. This in turn may hinder future interactions with people from those cultures through the creation of negative stereotypes.

In the last few years, researchers and practitioners have been working on creating digital tools that can be accessed whenever and wherever, to help people from all walks of life to mediate these misunderstandings and conflicts. These tools typically involve interactions with so-called intelligent agents, i.e. virtual characters that are able to take decisions autonomously, that behave as if they are a person from another culture. The aim of these interactions is to make potential trainees experience how misunderstandings can shape interactions with and perceptions of people from other cultures.

These tools usually aim to increase the intercultural competence of trainees with people from specific cultures. They are particularly useful if one is planning to work or live in a certain country, but may not be as useful when one has to interact with people from other cultures. Some work has been done on this topic, but, before we started this work, there were no agent-based intercultural training tools that could be used to increase the intercultural competence of trainees with people from a wide range of cultures.

In this work, we take the first steps in the design of a digital culture-general training tool to help young adults deal with misunderstandings or conflicts due to differences in culture, through interactions with intelligent agents.

The design of such a tool is representative of design science, which is concerned with the creation of artefacts that can be used to change an existing situation into a preferred situation. Instead of positing new theories, design science contributes to the existing knowledge base through four design outputs: constructs, models, methods, and implementations.

The creation of these outputs depends on the integration of knowledge, design, and the real world, which is described in the *Three Cycle View of Design Science Research* described by Hevner and colleagues. Both the outputs of design science and this model of design science, form the methodological basis of this thesis, and have been used to formalize each stage of this work.

To help structure the design process, we have posed the following design research questions:

Design Research Question 1 (DRQ1) – Which concepts are required to describe the design of a digital culture-general training tool involving agents that show culturally varying behaviour?

Design Research Question 2 (DRQ2) – Can we use theories of culture to create scripted scenarios in which virtual characters behave appropriately for a given culture?

Design Research Question 3 (DRQ3) – Can we identify requirements for socio-cultural agents that can help them to make sense of their social world?

Design Research Question 4 (DRQ4) – Can we create intelligent agents that can vary their behaviour depending on the culture to be simulated?

Design Research Question 5 (DRQ5) – Can we create critical incidents, involving intelligent agents that show appropriate behaviour for given cultures, through which potential trainees become more sensitive to and knowledgeable about differences across cultures?

The main findings of this work provide answers to these research questions.

The answer to DRQ1 can be found in the glossary, which presents the key concepts that have been used in this work to create agents that show culturally varying behaviour and to create scenarios that incorporate these agents to increase the intercultural competence of trainees.

DRQ2 is the focus of Chapter 2. To answer this question we designed scripted scenarios in which virtual characters show culturally varying behaviour based on a theory of culture, in this case one of Hofstede's dimensions of culture. To ensure that the behaviours of these virtual characters were representative of real-life cultural differences, we conducted an evaluation with people from a wide range of cultures. Participants had to judge the characters and their behaviours in terms of appropriateness.

The results showed significant differences in appropriateness between scenarios, but not those that we expected; it seemed that our scenarios targeted another dimension of culture. The scenarios were adjusted based on the comments of the participants, to ensure that they match the dimension that we originally wanted to target. The new and old scenarios were then evaluated with people from a wide range of cultures. The results from

the second evaluation seemed to suggest that the behaviours of the characters in the new scenarios were able to target the intended dimension of culture.

It thus seems likely the dimensions of culture can be used to generate culturally varying behaviour in agents, but that extensive (pre)testing is required to ensure that the underlying intention of the behaviour, which is inspired by the designers' interpretation of theories of culture, aligns with the users' interpretation of that behaviour.

DRQ3 is answered in Chapter 3. In this chapter, we focus on describing important concepts of social interactions based on theories from sociology and psychology. These concepts are incorporated into a *conceptual model for socio-cultural agents* that can be used to describe their social world.

The model differentiates between three levels of analysis: the interaction, the group, and the society. These levels range from being more specific, and thus more visible, to more abstract, and thus less visible, and help us to understand how each level affects interpretation and behaviour.

On an interaction level, we can identify three important concepts: rituals, participants, and the environment. The ritual describes the process of two or more people exchanging symbolic messages. The meaning of this ritual may change depending on the participants, those who participate in the ritual, and the environment, the physical location of the ritual.

On a group level, we can identify three important concepts: moral circles, social norms, and relational primitives. Moral circles help to divide between people who are worthy of moral consideration, and those who are not. Based on the most salient moral circle, different social norms, i.e. guides to short-term behaviour, may be active. Relational primitives, such as moral circle status and reputation, can help to discriminate between moral circle members.

On a society level, we can identify one important concept: cultural meta-norms. A cultural meta-norm is a rule that, based on the cultural script of an intelligent agent and the context, changes the salience of both moral circles and social norms, and changes the weighting of relational primitives.

In Chapter 4, we address DRQ4. In this chapter, we describe the creation of intelligent agents that show culturally varying behaviour.

We use the *Social Importance Dynamics model* to create believable social interactions, in which agents attribute, claim, and confer social importance in their interactions with other agents and users. Social importance is a way to measure the importance of a certain individual in the eyes of others. The strength of attribution, claims, and conferrals was varied using cultural modifiers, following the line of cultural meta-norms in Chapter 4.

To ensure that the intelligent agents showed behaviour representative of a given culture, we created collectivistic and individualistic agents and evaluated these with par-

ticipants from the Netherlands (a highly individualistic country) and from Portugal (a rather collectivistic country). The participants were divided into groups and had to judge the behaviour of the individualistic or collectivistic agents.

We found that the Portuguese participants perceived the collectivistic agents as more appropriate than the Dutch participants. We did not find the reverse, but we believe that this is due to there being too few socially inappropriate actions in the scenario with the individualistic agents. The results suggest that it is possible to create intelligent agents that can act out appropriate culturally varying behaviour for a given culture.

DRQ5 is answered in Chapter 5. In this chapter, we focus on applying different methods of intercultural training, i.e. experiential versus didactic approaches and story versus non-story approaches, in the design of a digital culture-general training tool. We conducted an evaluation to discover which method of intercultural training was more effective in making people aware of misunderstandings due to differences in culture. We found that experiential and story-based scenarios led to participants being more critical of their own behaviour than non-experiential and non-story-based scenarios.

We then created a larger set of critical incidents, this time involving the intelligent agent architecture that was used in Chapter 4. To ensure that the critical incidents led to an attribution of perceived differences in behaviour to specific differences in culture and to (potential) trainees becoming less judgemental of inappropriate behaviours by people from different cultures, we evaluated the tool with students from an international university and students from a university with primarily Dutch students.

We found that the tool had an effect on the Dutch students, i.e. they were significantly more aware that one aspect of cultural differences may occur, but it did not have an effect on the international students. The results suggest that it is possible to create agent-based critical incidents to make potential trainees more knowledgeable about differences across cultures.

The findings to our design research questions represent a set of important contributions to the field.

First, we have identified and structured important concepts to better understand the design and implementation of socio-cultural agents and the design of critical incidents that involve these agents for intercultural training. These concepts may be used to structure the field, improve communication between people from different fields, and help to identify important issues that still need to be solved.

Second, we have described and used models that help to define the simulated world of the agents and help them to navigate through that world. These two parts are described respectively in the conceptual model for socio-cultural agents and the social importance dynamics model using cultural modifiers. Most of the elements have been combined to ensure that the agents behaved appropriately within certain contexts; other elements still need to be integrated in future work.

These models have proven extremely useful to structure the process of creating believable socio-cultural agents. They may be used to analyse misunderstandings and conflicts in a systematic manner. This will lead to a greater understanding on the levels of analysis involved in an interaction between individuals and help to understand why certain misunderstandings have occurred. The models may also be used to generate critical incidents in a systematic manner, by establishing the concepts that are present and relevant in an interaction between users and intelligent agents.

Besides their use in describing and generating incidents, these models can also be used by researchers to determine the scope of an agent-based system. This may be useful for researchers or practitioners creating socio-cultural agents.

Third, we have attempted to systematize the process of creating scenarios involving agents that show culturally varying behaviour through a set of guidelines that need to be met to ensure that the behaviour of socio-cultural characters is properly evaluated. These guidelines primarily revolve around making sure that the intentions of the designers match the perceptions of the users.

Fourth, besides conceptual elements, we have also created practical implementations. The agent-based architecture that was used in this work and the educational scenario, involving the critical incidents, are freely available and can be adapted for use in different contexts or applications.

In our work, we have only taken the first steps in designing a digital culture-general training tool. Additional work on the generalization and validation of the critical incidents and the behaviours of the agents is still required, however, we believe that our results show our approach to be viable. It may lead to the creation of self-contained intercultural training tools that can be used by people from a wide range of cultures.

We believe that future work will have to focus on three fields: understanding how trainees can be emotionally engaged in the scenarios, systematizing the process of using model-driven approaches to generate socio-cultural behaviour, and using the design outputs in different contexts and with different people from different cultures.

Samenvatting

Mensen van over de hele wereld komen steeds meer met elkaar in contact. Dit proces gaat echter niet altijd goed; sociale interacties met mensen van verschillende culturen kunnen leiden tot misverstanden en soms zelfs conflicten. Deze problemen kunnen er uiteindelijk voor zorgen dat iemand in de toekomst heel anders om zal gaan met mensen van andere culturen (wat dus kan leiden tot negatieve stereotypes).

In de laatste jaren zijn wetenschappers en praktijkbeoefenaars bezig geweest met het maken van digitale hulpmiddelen die overal en altijd gebruikt kunnen worden om mensen leren om te gaan met deze misverstanden en conflicten. Dit soort hulpmiddelen laten de gebruikers meestal in een virtuele omgeving deelnemen aan sociale interacties. Deze interacties worden ook wel kritieke incidenten genoemd, omdat er de mogelijkheid is dat er een misverstand of conflict kan optreden.

Centraal in deze incidenten staan zogenaamde intelligente 'agents'. Deze agents zijn te beschouwen als virtuele mensen, die in staat zijn om zelfstandig beslissingen te nemen en zich te gedragen alsof zij uit een bepaalde cultuur komen. Echter, de intelligentie van dat soort agents valt vaak nogal tegen, vooral op sociaal en cultureel vlak. Dat is dus ook één van de aandachtspunten van dit proefschrift.

Deze agents en de virtuele werelden waarin zij leven, worden vaak ingezet om trainees beter om te laten gaan met mensen uit specifieke culturen (denk hierbij bijvoorbeeld aan een training voor iemand die graag in het Midden-Oosten wil gaan werken). Dit is nuttig als iemand in een specifiek land wil gaan werken of wonen, maar is minder nuttig als diegene dan om moet gaan met mensen die weer uit een andere cultuur komen. In het verleden is er al wat werk verricht aan dit onderwerp, maar voordat wij gestart waren met dit werk was er nog geen trainingstool die gebruik maakte van intelligente agents, om trainees te leren omgaan met mensen uit verscheidene culturen.

In dit werk zetten wij de eerste stappen in het ontwerpen van een digitale tool die jongvolwassenen helpt om om te gaan met de misverstanden en conflicten die optreden door cultuurverschillen. Dit doen wij door ze deel te laten nemen aan sociale interacties met intelligente agents die zich gedragen alsof zij uit verschillende culturen komen.

Het ontwerpen van een dergelijke tool is representatief voor ontwerpgericht onderzoek. Deze vorm van onderzoek wordt vaak ingezet bij het ontwikkelen van producten die gebruikt worden om een huidige situatie te veranderen in een gewenste situatie. In plaats van het ontwikkelen van nieuwe theorieën, focust ontwerpgericht onderzoek zich op het uitbreiden van de huidige kennis door vier ontwerp-elementen: constructen, modellen, methoden en implementaties.

Het succesvol ontwerp van deze elementen hangt af van een zorgvuldige integratie van de huidige kennis, het te ontwerpen product en de huidige situatie, zoals beschreven in de *Three Cycle View of Design Science Research* opgesteld door Hevner en collega's. De ontwerp-elementen en het model van ontwerpgericht onderzoek vormen de methodologische basis van dit proefschrift en zijn gebruikt om de ontwerpstappen in dit werk te formaliseren.

Om het ontwerpproces verder te structuren hebben we de volgende ontwerpgerichte onderzoeksvragen gesteld:

Ontwerpgerichte onderzoeksvraag 1 (OOV1) – Welke concepten zijn nodig om het ontwerp van een digitale interculturele trainingstool, waarin intelligente agents centraal staan die verschillende gedragingen vertonen afhankelijk van de cultuur die gepresenteerd moet worden, te beschrijven?

Ontwerpgerichte onderzoeksvraag 2 (OOV2) – Kunnen we theorieën over cultuur gebruiken om vooraf bepaalde scenario's te maken waarin virtuele karakters centraal staan die zich gepast gedragen voor een gegeven cultuur?

Ontwerpgerichte onderzoeksvraag 3 (OOV3) – Kunnen we randvoorwaarden identificeren voor sociaal-culturele agents die hen kunnen helpen om hun sociale wereld te begrijpen?

Ontwerpgerichte onderzoeksvraag 4 (OOV4) – Kunnen we intelligente agents creëren die hun gedrag kunnen aanpassen afhankelijk van de cultuur die gesimuleerd moet worden?

Ontwerpgerichte onderzoeksvraag 5 (OOV5) – Kunnen we kritieke incidenten creëren, waarin intelligente agents gepast gedrag vertonen voor gegeven culturen, die potentiële trainees meer bewust maken over verschillen in cultuur?

Het antwoord op OOV1 kan gevonden worden in de verklarende woordenlijst in het begin van dit proefschrift. In deze woordenlijst staan de belangrijkste concepten die gebruikt zijn in dit werk om tot twee verschillende zaken te komen: 1) de intelligente agents die verschillend gedrag vertonen voor verschillende culturen en 2) de kritieke incidenten die de interculturele competentie van potentiële trainees pogen te verhogen.

OOV2 is de focus van hoofdstuk 2. Om deze vraag te beantwoorden hebben we verschillende vooraf bepaalde scenario's in een virtuele omgeving uitgewerkt. In deze scenario's staat een interactie tussen twee virtuele karakters centraal; in elk scenario laten we elk van de karakters zich gepast gedragen voor een bepaalde cultuur.

Deze verschillen in gedragingen zijn gebaseerd op een theorie over cultuur, namelijk de cultuurdimensies van Hofstede en collega's; de karakters gedragen zich alsof zij uit

een feministische cultuur komen, of alsof zij uit een masculine cultuur komen. Om er voor te zorgen dat de gedragingen van deze karakters representatief zijn voor hoe echte mensen uit dat soort culturen zich zouden gedragen, hebben we een evaluatieonderzoek gehouden onder mensen uit verschillende culturen. Proefpersonen moesten beoordelen of de karakters uit de verschillende scenario's zich wel gepast gedroegen.

De resultaten lieten zien dat er significante verschillen in de perceptie van gepastheid waren tussen de scenario's, maar niet diegene die wij verwacht hadden. Het leek alsof de agents zich gepaster gedroegen voor een andere set van cultuurdimensies (individualistisch versus collectivistisch) dan diegene die wij wilden simuleren. De scenario's zijn toen aangepast naar aanleiding van het commentaar van de proefpersonen en, samen met de oude scenarios, weer geëvalueerd met mensen uit verschillende culturen. De resultaten van de tweede evaluatie gaven aan dat de gedragingen van de virtuele karakters in de nieuwe scenario's wel gepast leken te zijn voor de culturen die wij wilden simuleren.

Het is dus mogelijk gebleken om een theorie over cultuur te gebruiken om het gedrag van virtuele karakters te veranderen om zodoende een bepaalde cultuur te simuleren. Het is wel nodig om de karakters vooraf uitgebreid te testen, om er voor te zorgen dat de achterliggende intentie van het gedrag van de karakters, dat geïnspireerd is door de interpretatie van theorieën over cultuur, overeenkomen met de perceptie van het gedrag van de karakters.

OOV3 wordt beantwoord in hoofdstuk 3. In dit hoofdstuk focussen wij op het beschrijven van belangrijke elementen die centraal staan in sociale interacties, aan de hand van theorieën uit de sociologie en psychologie. Deze elementen zijn gebruikt om een conceptueel model te maken dat gebruikt kan worden om de sociale wereld van sociaal-culturele agents te beschrijven.

Het model onderscheidt tussen drie niveaus van analyse: de interactie, de groep en de samenleving. Deze niveaus variëren van meer specifiek, en dus gemakkelijker zichtbaar, naar meer abstract, en dus minder gemakkelijk zichtbaar. Voor elk niveau is te bepalen welke elementen effect moeten hebben op de interpretatie en het gedrag van de agents.

Op het interactieniveau kunnen wij drie belangrijke concepten onderscheiden: de rituelen, de deelnemers en de omgeving. Het ritueel beschrijft het proces van twee of meer personen die symbolische boodschappen uitwisselen. De betekenis van dit ritueel, en dus de betekenis van de symbolische berichten, hangt af van de deelnemers en de fysieke locatie van het ritueel.

Op het groepsniveau kunnen we drie belangrijke concepten onderscheiden: morele cirkels, sociale normen en relationele variabelen. Morele cirkels gebruiken wij om onderscheid te maken tussen mensen die, vanuit het perspectief van een agent, wel of niet in aanmerking komen voor morele rechten en plichten. Sociale normen kunnen de agent dan helpen om te bepalen wat geschikt gedrag is binnen die morele cirkel. Leden van morele cirkels kunnen elkaar onderscheiden naar relationele variabelen zoals status en reputatie.

Op het samenlevingsniveau kunnen we één belangrijk concept identificeren: culturele metanormen. Een culturele metanorm is een regel die, gebaseerd op de cultuur die gesimuleerd moet worden en de context, de belangrijkheid van morele cirkels, sociale normen en relationele variabelen verandert.

In hoofdstuk vier staat het antwoord op OOV4. In dit hoofdstuk beschrijven wij het ontwerp van intelligente agents die verschillende gedragingen vertonen afhankelijk van de cultuur die gesimuleerd moet worden.

We gebruiken het *Social Importance Dynamics model*, gebaseerd op de status-power theorie van Kemper, om geloofwaardige sociale interacties te maken. In deze interacties kunnen intelligente agents 'sociaal gewicht' attribueren aan anderen en sociaal gewicht claimen van en overdragen aan anderen. 'Sociaal gewicht' is een manier om de belangrijkheid van een bepaald individu te meten door de ogen van een ander. De hoeveelheid sociaal gewicht die geattribueerd, geclaimd en overgedragen wordt is afhankelijk van de cultuur die gesimuleerd moet worden.

Gebaseerd op de theorie van Hofstede en zijn collega's, hebben wij zogenaamde collectivistische en individualistische agents gemaakt. Om er voor te zorgen dat het gedrag van deze agents representatief is voor het gedrag dat gepast is in dat soort culturen, hebben wij de verschillende agents laten beoordelen door proefpersonen uit Nederland (een erg individualistisch land) en uit Portugal (een collectivistisch land).

Uit onze resultaten is gebleken dat de Portugese proefpersonen het gedrag van de collectivistische agents als meer gepast beschouwden dan de Nederlandse proefpersonen. We hebben niet het omgekeerde gevonden, maar wij geloven dat dit is gekomen doordat er te weinig sociaal ongepaste acties in het scenario met de individualistische agents zaten. De resultaten laten zien dat het mogelijk is om intelligente agents te maken die verschillende gedragen vertonen afhankelijk van de cultuur die gesimuleerd moet worden.

OOV5 wordt beantwoord in hoofdstuk 5. In dit hoofdstuk focussen wij op het toepassen van verschillende methoden van intercultureel trainen in een trainingstool. Hieronder verstaan wij experiëntiële versus didactische methoden en verhalende versus niet-verhalende methoden. Deze methoden zijn verwerkt in een aantal kritieke incidenten en zijn vervolgens geëvalueerd om te zien welke van deze methoden het best gebruikt kan worden om mensen bewust te maken van misverstanden die ontstaan door verschillen in cultuur. Uit onze resultaten is gebleken dat de scenario's die experiëntiëler en verhalender waren de proefpersonen kritischer maakten over hun eigen gedrag.

Om deze bevindingen in een complete trainingstool uit te zetten, hebben wij het aantal incidenten uitgebreid en de intelligente agents gebruikt uit hoofdstuk 4. Deze incidenten zijn, net zoals in voorgaande onderzoeken, gebaseerd op verschillende cultuurdimensies. Om te controleren dat deze tool leidt tot een verandering in de gebruiker, hebben wij deze incidenten geëvalueerd met studenten van een internationale universiteit en met studenten van een universiteit met voornamelijk Nederlandse studenten.

We hebben gevonden dat de incidenten een effect hebben gehad op de Nederlandse studenten. Nadat ze door de incidenten heen waren gegaan, waren ze zich er significant meer van bewust dat één aspect van cultuur voor kan komen. Er was geen effect bij de studenten van de internationale universiteit. Deze resultaten geven aan dat het mogelijk is om kritieke incidenten te maken, met intelligente agents, die de kennis van potentiële trainees over cultuurverschillen verhogen.

De resultaten van de ontwerpgerichte onderzoeksvragen representeren een belangrijke set van wetenschappelijk en praktisch relevante contributies.

Allereerst, we hebben een aantal belangrijke concepten geïdentificeerd en beschreven, die ons helpen om het ontwerp van sociaal-culturele agents en de kritieke incidenten waartoe zij behoren, beter te begrijpen. Deze concepten kunnen gebruikt worden om het veld te structureren, communicatie te verbeteren tussen mensen uit verschillende disciplines en belangrijke problemen te identificeren die nog opgelost moeten worden.

Ten tweede, we hebben een aantal modellen beschreven, namelijk het conceptueel model voor sociaal-culturele agents en het 'social importance dynamics model'. Deze modellen kunnen gebruikt worden om de sociale wereld van de agents te beschrijven en hen te helpen om door die wereld te navigeren. De meeste elementen van deze modellen zijn in dit werk gecombineerd; andere elementen moeten nog geïntegreerd worden in toekomstig werk.

Deze modellen zijn erg nuttig gebleken om het ontwerpproces van sociaal-culturele agents te structureren. Ze kunnen gebruikt worden om misverstanden en conflicten te analyseren op een systematische manier, om zo te achterhalen waarom deze misverstanden en conflicten plaats hebben gevonden. Ze kunnen ook gebruikt worden om kritieke incidenten te genereren op een systematische manier, door het bepalen van de elementen die relevant zijn in een sociale interactie (tussen intelligente agents en mensen).

Ten derde hebben we het ontwerpproces van de kritieke incidenten proberen te systematiseren door het opstellen van een set van evaluatie-richtlijnen. Deze richtlijnen zijn bedoeld om er voor te zorgen dat de karakters zich gepast gedragen voor een bepaalde cultuur.

Ten vierde hebben wij, naast het maken van conceptuele elementen, ook gewerkt aan praktische implementaties. Het systeem dat de agents aanstuurt, is vrijelijk beschikbaar en kan aangepast worden voor gebruik in verschillende contexten of applicaties.

In ons werk hebben wij de eerste stappen gemaakt in het ontwerpen van een interculturele trainingstool die gebruikt kan worden om mensen bewust te maken van verschillen in cultuur. Op het gebied van validiteit en generaliseerbaarheid ligt er nog meer werk in de toekomst, maar, zoals blijkt uit de resultaten, biedt dit proefschrift een stevige basis om dergelijk werk op voort te laten bouwen.

We geloven dat toekomstig werk zich zal moeten richten op drie velden: begrijpen hoe trainees emotioneel betrokken kunnen worden in de kritieke incidenten, het systematiseren van het ontwerpproces van de agents, en het gebruik van ons werk in verschillende contexten en met mensen uit verschillende culturen.

About the Author

Dominic Michael (Nick) Degens was born in Chertsey, a small city outside of London (United Kingdom), on the 11th of June 1985. He was born to a Dutch mother and an English father. Due to his father's work, he moved to the Netherlands at an early age.

He attended the atheneum at the Dr. Nassau College in Assen from 1998 to 2003. In 2003, he started a BSc course in *artificial intelligence* at the University of Groningen, which he completed in 2007. After finishing his studies on artificial intelligence, he became interested in the development of educational technology. Because of this interest, he started an MSc program in *education and communication in mathematics and natural sciences* in 2008, again at the University of Groningen. Throughout this course, he focused on the design of educational games as a way to educate people about STEM topics.

Before and after finishing his MSc course in 2010, he worked at *Science LinX*, the science centre of the University of Groningen. Here, he designed educational games for secondary education together with domain experts and game developers.

In September 2010, Nick found a way to combine his interest in artificial intelligence and educational technology through a position as a Ph.D. researcher at the Information Technology department of Wageningen University. In this capacity, he was supervised by dr. ir. Gert Jan Hofstede (co-promotor) and prof. ir. Adrie Beulens (promotor).

In his work, he participated as part of the FP7 project eCute, funded by the European Union, and worked together with researchers from five other universities across Europe and two from Japan to create two intercultural training showcases for children and young adults involving the use of virtual agents. As a result, Nick wrote his doctoral thesis on the design of intelligent agents that show culturally varying behaviour and the design of engaging intercultural training scenarios. The work that occurred as part of the eCute project and Nick's doctoral thesis was disseminated through presentations, workshops, and demonstrations at international conferences.

In 2013, Nick continued his Ph.D. studies part-time while also working as a lecturer and researcher at the Game Design & Development group of the Hanze University of Applied Sciences in Groningen. Here he gave courses on Educational Game Design, User Experience, and Design Research. He also worked as part of the research group User-Centered Design. Nick will continue to work here, hoping to further research on the effective design of educational games.

Completed Training and Supervision Plan

Dominic Michael Degens

Wageningen School of Social Sciences (WASS)

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
Summer School on 'Designing Simulation Games for Education and Training'	International Simulation and Gaming Association	2011	3
Game Engine Programming	University of Utrecht	2011	7.5
Research Proposal	Wageningen School for Social Sciences (WASS)	2011	6
B) General research related competences			
'When agents meet: empathy, moral circle, ritual and culture'	Workshop on 'Emotional and Empathic Agents' at the International Conference on Autonomous Agents and Multiagent Systems	2012	1.5
'Traveller: Interacting with agents to deal with misunderstandings due to culture'	International Conference on the Foundations of Digital Games	2013	1.5
Research Methodology: From Topic to Proposal	WASS	2011	4
Teaching and supervising • Bachelor / Master students • 'Simulating Emergence' & 'Computers, Communication & Information'	Wageningen University	2010	3
C) Career related competences/personal development			
Competence Assessment	Wageningen Graduate Schools (WGS)	2010	0.3
Interpersonal Communication for PhD Students	WGS	2011	0.6
Scientific publishing	WGS	2010	0.3
Techniques for Writing and Presenting Scientific Papers	WGS	2011	1.2
Writing for Academic Publication	Wageningen University	2012	3
'Cultural Characters in Games and Learning'	International Conference on Intelligent Virtual Agents	2013	1
'Culturally-aware Technology Enhanced Learning'	European Conference on Technology Enhanced Learning	2013	1
Dagstuhl Seminar on 'Computational Models of Cultural Behaviour for Human-Agent Interaction'	Dagstuhl	2014	2
Total			36.2

*One credit according to ECTS is on average equivalent to 28 hours of study load

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