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# Artificial Culture in Artificial Societies

## (Doctoral Consortium)

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### ABSTRACT

In this article, I present the state of my research on modeling and simulating the impact of a culture on artificial organizations and artificial societies. In particular, I aim at replicating the effect of culture at the individual level in order to observe the consequences at the collective level. Thus, I expect to reproduce organizational structural and performance (efficiency, robustness, flexibility) changes in different countries as well as cultural clashes in cross-cultural settings. On a different time scale, such a model of culture will be used used to investigate the link between the level of development of a society and the individual conception of the world carried on by its culture.

### Categories and Subject Descriptors

I.2.11 [Distributed Artificial Intelligence]: Multiagent systems; I.6.5 [Simulation and Modelling]: Model Developments; J.4 [Social and Behavioral Sciences]: Sociology

### Keywords

Artificial societies, Emergent behavior, Simulation techniques, tools and environments, Social simulation

## 1. INTRODUCTION

Humans have evolved from primates due to their capability of constructing, transferring and, more particularly, retaining large amounts of knowledge. This knowledge, when shared amongst a community, is referred to as culture. Culture is necessary to transmit and share knowledge between individuals and across generations. This knowledge, which is technical but also social, implies that sharing a culture (defined as a collection of values and practices by [6]) leads to sharing expectations on acceptable motives and behaviors for individuals. These expectations make possible the formation of groups of individuals linked by other motives than sharing a kinship [9].

As a result, organizations, as a way to bring on the interaction between several (unrelated) individuals, are naturally sensitive to culture. Particularly nowadays, easy access to

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world-wide communications simplifies the creation of multi-cultural organizations. But how individuals, who may have radically different embedded drives and expectations, may interact in a positive way? Misunderstandings easily lead to mutual distrust amongst individuals and failures at the organizational level. In order to help decision makers to prevent cultural clashes, one of the goals of my PhD is to build a agent-based model of organizations where agents are influenced by their culture.

[1] noticed that the way a society is ruled is tightly connected with some of its cultural values. Thus, for instance, a chiefdom can exist only if individuals consider as normal that someone takes the lead. The paradigm used to construct a society and the culture of its members are clearly connected. The second goal of my PhD consists in creating a model of culture that can evolve during a simulation. Then, I can create a simulation that replicates the evolution of the structure of a society from the first ages to nowadays, according to social sciences theories ([1, 2, 6, 7]).

## 2. CULTURE AND ORGANIZATIONS

[6] empirically found that (national) cultures, independently on any specific model, can be classified along 5 dimensions: power distance, individualism, masculinity, uncertainty avoidance, long-term orientation. Each of these dimensions describe the relative importance given by a same culture some peculiar type of values and practices. For instance, an individual in a high power distance culture is more likely to desire differences of power amongst people and to be one's subordinate. Obviously, organizations are influenced by culture. For instance, if an individual with a low power distance culture directs another one with a high power distance culture, the former may think the subordinate is lazy while the latter may be frustrated to receive unclear instructions. Similarly, the reproduction of an organizational pattern in another country can often lead to cultural misinterpretation [5]. For instance, the success of the implementation of a machine bureaucracy is correlated with a high power distance culture. This type of organization can also be implemented in a low power distance culture, but its performance is likely to be altered.

So far, I conceptualized the link between cultures and organizations in order to formalize it. Previous work about cultures [3, 6, 9] remains very descriptive and has not yet resulted in a formal model. Organizations have been partially formalized [4] even if some features are still at the descriptive level [8]. In order to highlight important concepts needed to link both culture and organizations, I mapped the

influence of culture on organizational features. For instance, culture impacts the way individuals establish and use formal connexions (e.g. leader-oriented in high power distance culture) and the impact on the global structure (flat or high hierarchy). Additionally, I investigate the effect of cultural setting variation on organizational performance (efficiency, robustness, flexibility). I found that some cultural aspects have a positive effect on one performance indicator but are detrimental on another. For instance, a high power distance culture increases the efficiency of the organization but centralization of power in few leaders reduces its robustness.

In the following, I will use this conceptualization to build an agent-based model of organizations influenced by culture. The agent-based level of description will allow to capture phenomena like the emergence of inter-individual conflicts due to cultural mismatch. In a longer term, we expect to build a decision support tool that can inform stakeholders about consequences that can result from the cultural interpretation of their choices. Moreover, with an operational model of culture and organizations, it will be possible to influence the performance parameters of an organization in setting out-of-the-box cultural parameters.

### 3. CULTURE AND HUMAN DEVELOPMENT

Multiple social science theories describe the evolution of human societies through a sequence of stages of development [1, 2]. This evolution is built on a loop: a given society fits certain life conditions (e.g. a family-oriented tribe when the food is sparse). When life conditions change (e.g. an increase in productivity) the society can become unfit (overpopulation), leading to individual shift in priorities and values and so, in culture (e.g. obey the strongest one in order to gain protection). This collective shift alters in turn the society (e.g. dominance system leading to a chiefdom), influencing back the life conditions.

So far, I was inspired by the descriptions from [2] to create a method to build societies capable of expanding themselves with new institutions from bottom-up, initially without considering culture. I applied this method in order to build a model and a simulation of a society evolving through the first stages of human development. In my method, a set of institutions is described, along with their precondition, costs and effects. In a favorable environment, the society grows until reaching the limits of its current stage, which leads to social issues. If these issues are too frequent, individuals, through communication, become socially aware of the situation. In this case, they create the institution with the goal of solving the initial social problem (specified by its precondition) which incites some individuals to perform a behavior solving the issue, leading the society to its next stage. Thus, the society is capable of expanding its set of institutions from bottom-up in order to resolve its social issues.

[1] extends the description from [2] in linking each social stage with a cultural pattern. Each stage is characterized by a social paradigm which can emerge only if individuals share a cultural pattern matching with this stage. Thus, a stage change is a consequence of a cultural change, resulting itself from environmental and social evolution. In the future, I plan to extend my work in order to introduce the impact of culture which radically changes the individual perspective of their environment. This extension will capture the long-term dynamics of societal changes, in particular, the link between culture and the emergence of social patterns. This

link will allow for instance to describe behaviors typical from a stage (slavery is a normal practice at a chiefdom stage). Such a simulation can be used to replicate a given historical setting, giving some grip to teachers about the cultural causes that made a conflict inevitable.

### 4. CONCLUSIONS AND FUTURE WORK

In this article, I introduced my research about two frameworks that will benefit from the creation of a model of culture. First, I described my work on how to connect an artificial culture with artificial organizations. I also presented my method for building societies that can dynamically expand themselves from bottom-up with new institutions in order to cope with emerging social issues. I described how to use this method in order to build a model that replicates the first stages of human societies.

My next step will aim at formalizing culture in an agent-based models. I plan to build a model inspired from [6], which describes culture as a collection of values and practices. This cultural model should be capable of handling dynamic changes in culture. [6] informally describes that values and more sensibly practices are capable of changing to fit the environment of their host. This cultural flexibility is necessary to build a realistic model of culture which makes agents capable of fitting with the practice of an organization but also to evolve through time due to changing environmental conditions. Then, this model can be used to model and replicate the state of mind of inhabitants of artificial societies evolving through a succession of social stages.

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