

**Proposal full title:** Memetic Dynamics between Cognitive Agents

**Proposal acronym:** MEMDYN

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2	University of Nottingham	UoN
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## **Proposal summary page**

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Activity code addressed: “*NEST-2005-Path-CUL*” (for *Cultural Dynamics*)

## **Proposal abstract**

Cultural traits are transmitted from person to person, similarly to viruses. Such a belief, idea or behavior that is reproduced from mind to mind has been called a *meme*. Like genes or viruses, memes undergo processes of reproduction, mutation, and natural selection, thus suggesting an analogy between cultural and biological evolution. Memes differ in their degree of “fitness”, i.e. adaptedness to the socio-cultural environment in which they propagate. Fitter memes will be more successful in being communicated, “infecting” more individuals and thus spreading over a larger population. This analogy allows us to apply evolutionary principles to model cultural dynamics.

However, in spite of several theoretical and mathematical models that have been proposed along these lines, the memetic perspective on culture remains poorly developed and controversial. The main criticisms are that memetic theories are too reductionist, and too vague to be tested by empirical observations. The present proposal wishes to address these shortcomings and thus put memetics on a sound footing as a foundation for cultural dynamics.

To achieve this, we propose to develop a detailed theoretical model that produces concrete and testable predictions about the factors that determine whether a cultural trait will propagate or not. Our basic assumption is that individuals are not passive “carriers” of a meme, but intelligent agents who use their judgment to decide whether to accept or transmit a cultural trait. This implies among others that successful memes need to be consistent with the knowledge, values and instincts of the people who transmit them.

Our model will be operationalized by means of extensive software and robotic simulations of memetic transmission and evolution. Moreover, its predictions will be elaborated and tested in laboratory experiments with human subjects, and in real-life situations where we can observe how a particular idea spreads through a population.

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# MEMDYN: Memetic Dynamics between Cognitive Agents

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## B.1 Scientific and technological objectives of the project and state of the art

### Introduction

The transmission of cultural traits is a process that in many ways resembles the spread of an infectious disease: the initial carrier of a certain idea or attitude directly or indirectly communicates this idea to another person, who now also becomes a carrier, ready to “infect” further people. Thus, cultural traits are often presented as analogous to *mind viruses* [Dawkins, 1993; Brodie, 1996] or *thought contagions* [Lynch, 1996], that are reproduced from mind to mind via communication or imitation. A truly successful trait is one that spreads like an epidemic, infecting the whole of the population, in order to end up as a stable, endemic component of that population’s culture.

This virus metaphor is attractive in that it suggests a new perspective and new methods (e.g. epidemiology) for studying cultural dynamics. However, in order to turn it into a well-founded scientific theory, we need a deeper understanding of the underlying assumptions and implications of this analogy. This is necessary in particular if we wish to broaden our perspective on culture from mere *transmission* to *innovation*, i.e. the processes by which cultural traits mutate and evolve. For this, we can turn to the science that studies viruses and other self-reproducing systems: biology.

It is an old idea to see a correspondence between cultural and biological evolution, with cultural entities undergoing similar (but certainly not identical) processes of variation, replication and natural selection as organisms or genes. This idea has gotten a new impetus with the introduction, by Richard Dawkins [1989], of the concept of a *meme* (for a review see [Aunger, 2004]; names in **bold** refer to members of the consortium). A meme, named in analogy with a gene, is defined as a cultural replicator, i.e. an element of culture such as a tradition, belief, idea, melody, or fashion, that can be held in memory and transmitted or copied to the memory of another person.

The core idea is that memes differ in their degree of “fitness”, i.e. adaptedness to the socio-cultural environment in which they propagate [de Jong, 1999; Heylighen 1998]. Mutations and recombinations of existing ideas will produce a variety of memes that compete with each other for the attention of people. Fitter memes will be more successful in being communicated, “infecting” more individuals and thus spreading over a larger population. The resulting evolutionary dynamics is one of variation creating new meme variants, followed by natural selection retaining only the ones that are most fit. Thus, the Darwinian principle of the survival of the fittest can be seen to underly cultural evolution as well as biological evolution [Aunger, 2001, 2003; Durham, 1991; Lumsden & Wilson, 1981].

## State of the Art

Over the past twenty-five years, several models of cultural evolution have been proposed that study the propagation of memes or similarly defined cultural traits (e.g. “culturgens” [Lumsden & Wilson, 1981]). Most of those were purely theoretical, proposing various conceptualizations, implications and speculations based on the memetic perspective [e.g. Blackmore, 2000; Dennett, 1995; Flinn & Alexander, 1982; Hull, 1982; Lake, 1999]. Some studies were mathematical in nature, applying techniques from mathematical genetics or epidemiology to quantitatively estimate the spread of particular types of memes within a population [e.g. Cavalli-Sforza & Feldman, 1981; Boyd & Richerson, 1985; Lynch, 1998]. Others were computational, simulating the transmission of knowledge or behaviors between software agents [e.g. Gabora, 1995; Best, 1997]. A few were observational case studies, where the spread of a particular cultural phenomenon, such as a chain letter, an urban legend or a religious motif, was investigated qualitatively or quantitatively [e.g. Goodenough & Dawkins, 2002; Bennet et al., 2003; Heath et al., 2001; Schaller et al., 2002].

However, in spite of these advances, the memetic perspective on culture remains poorly developed and controversial [Aunger, 2001; Edmonds, 2002]. There are several reasons why memeticists haven't yet been able to convince the bulk of social and cultural scientists of the soundness of their approach.

First, the analogy with the gene, and its embodiment as DNA, seems to indicate that a meme should have a clear, well-delineated, stable structure. (Although we would like to note that Natural Selection as proposed by Darwin and Wallace was postulated 100 years before the structure of genes was elucidated by Watson and Crick). Cultural entities, such as beliefs, ideas, fashions, laws and other cultural norms, on the other hand are typically very fuzzy, difficult to define and constantly changing. Memetic models that are based on “hard”, formally defined units therefore only seem applicable to a very small subset of cultural phenomena. However, the biological analogy does not imply such rigidity: unlike higher organisms, the genes of bacteria and viruses too are in a flux, constantly mutating and exchanging bits of DNA with other organisms, but that doesn't imply that they do not obey evolutionary principles.

A second criticism of the memetic approach is that people are not passive “vehicles” or “carriers” of ideas and beliefs, the way they may carry viruses. Individuals actively interpret the information they receive in the light of their existing knowledge and values, and on the basis of that may decide to reject, accept, or modify the information that is communicated to them. In other words, individuals and groups actively intervene in the formulation and propagation of culture. In that sense, cultural evolution is to some degree Lamarckian rather than purely Darwinian.

A final criticism is that up to now memetic models have not yet been put to the test of empirical verification [Edmonds, 2002; Chielens & Heylighen, 2005]. Part of the reason is that existing memetic theories do not make sufficiently concrete predictions to be falsifiable by observation. Most of these theories remain very speculative, often hardly better than a form of “armchair philosophy”. Moreover, until now there simply have been very few empirical studies of how memes propagate, whether in the laboratory [e.g. Lyons & Kashima,

2003] or in real life, and as yet no clear link has been established between these observations and theoretical or mathematical models.

### Aims and working hypotheses

The present proposal wishes to address these criticisms and thus put memetics on a sound footing as a fundamental theory of cultural dynamics.

To achieve this, we should move beyond the idea of individuals as passive containers of memes or genes. Instead, individuals should be seen as intelligent, autonomous agents, who have their own goals and values, who make critical choices as to which information they accept or believe, who can learn and change their mind, and who have some degree of control about whom they communicate with and what they communicate about. In other words, to model the transmission and evolution of culture, we should start from agents endowed with a realistic psychological make-up. Moreover, we should take into account the complexity of social interaction, where people will preferentially communicate with those that belong to their own social network or “in-group”. The complex interaction between the features of the memes to be communicated, the individuals communicating, and the social structure directing the propagation of information should then provides us with a more detailed and realistic understanding of cultural dynamics.

However, to keep such an ambitious approach manageable, we will start from a number of relatively simple working hypotheses inspired by earlier research of the consortium partners [**Heylighen**, 1997, 1998; **Chielens & Heylighen**, 2005; **Van Overwalle & Heylighen**, 2006]. These working hypotheses will provide a first outline or skeleton for developing a broad theory of cultural dynamics that can be implemented in the form of simulations. Moreover, they will allow us to formulate a number of operational predictions that can be tested and refined through experiments and observations.

Our most basic working hypothesis is that individuals are cognitive agents. This means that they process incoming information depending on the knowledge they already have and the computing machinery they are endowed with, selectively retain some of that information in their memory, and selectively express some of that information to other agents. Generally, the transmission of information by an agent will change both the agent, who has learned something new, and the information, which may be affected by the knowledge the agent already had. Therefore, a meme reaching an agent, if it is reproduced at all, will typically be transmitted in a mutated form, possibly recombined with other information learned earlier. This explains why it is so difficult to define or pinpoint an individual meme. However, natural selection will pick out the memes who survive this transmission process relatively unchanged, and therefore the fittest memes, such as certain jokes, songs, religious beliefs, or brand names, will have a recognizable identity, together defining a shared culture.

This suggests a number of more concrete hypotheses that specify the features that identify fit memes. In earlier publications [**Heylighen**, 1997, 1998; **Chielens & Heylighen**, 2005], we have suggested several criteria for meme fitness, of which we will here sketch the ones most important for the present approach. These can be classified according to whether they depend on the individual assimilating the meme, or on the communication process

propagating the meme across a collective. An individual is more likely to assimilate and memorize a message if it is:

- 1) simple, i.e. easy to understand and remember,
- 2) valuable, i.e. if the information it contains is useful or has a clear emotional appeal,
- 3) consistent with what the individual already believes;
- 4) novel, i.e. to some degree unexpected or surprising;
- 5) encountered repeatedly, since each exposure will strengthen the memory trace.

A message is more likely to be communicated across several individual if it obeys the following criteria:

- 1) trust or authority: the source or sender of the message is considered trustworthy
- 2) publicity: the sender broadcasts or repeats the message to many receivers
- 3) conformity: the majority of senders support the same message
- 4) salience: the message is clearly expressed in a language or medium (e.g. a picture or a material object) that the receiver is experienced with.

Moreover, memes will be assimilated more readily if they fit in with our genetic predispositions as studied by evolutionary psychology [Barkow et al., 1992]. For example, our brain has evolved to quickly recognize faces, and therefore the “smiley” icon is a very successful meme. Similarly, disgust is a very powerful, instinctual emotion, and therefore urban legends that contain a stronger disgust component propagate more widely than those with a weaker component [Heath et al., 2001]

The basic objectives of our proposal are to test and elaborate these hypotheses using a variety of complementary methods, so as to produce a detailed, coherent and empirically supported model of cultural transmission and evolution.

## Methodology

The traditional way to test hypotheses is via observations and laboratory experiments. A basic methodology in this case would be to distinguish or create messages that vary along one or more of the hypothesized dimensions (e.g. a simple and a more complex version of the same story, or a story coming from a trusted source vs. one coming from a less trusted source). We can then check in how far the different variations are more or less successfully propagated within the population under observation. This provides a first, simple empirical test of the power of memetic modelling, which may form a basis for predicting which types of cultural items are most likely to be transmitted far and wide within society.

However, the complexity of cultural dynamics only comes to the fore when we consider the non-linear interactions between the different agents and the criteria they use to decide which information to assimilate and pass on. For example, people who regularly express ideas that are inconsistent with the receiver's beliefs will be considered untrustworthy. After a while, receivers will try to reduce their exposure to such sources they consider untrustworthy (e.g. propaganda from one's ideological enemies, or junk mail). This gets the senders of non-consistent messages in a vicious cycle, where they receive increasingly less attention. To counter this, they will typically invest more of their energy in publicity, expressing their ideas more frequently and forcefully. This is unlikely to convince the majority, but may create a

smaller minority that goes along with their unusual ideas. This minority, because its ideas are inconsistent with those of the majority, will tend to reduce its trust in and therefore its exposure to the majority ideas. If the communications within this minority are much more frequent and forceful than those with the outside majority, the initially non-conformist ideas may become the majority view, and thus the norm, within this subgroup. Thus the polarization of opinions may lead to a divergence in beliefs between subgroups. It leads to the emergence of different subcultures within the same larger group in a process not unlike evolutionary speciation.

This kind of non-linear dynamics will be studied through multi-agent computer simulations, in which we can accurately control the amount and type of interactions between agents, so as to find out the precise circumstances in which a message can propagate across the whole population, remain limited to a subgroup, or even amplify the cultural differences between subgroups. There have already been quite a few simulations of the propagation of beliefs or norms across spatially distributed populations, or across social networks (typically with a power-law distribution, meaning that some agents have so many contacts with others that they function as the “hubs” through which most of the information flows). However, these simulations typically make the simplifying kind of assumptions that we criticized earlier, seeing memes as rigid pieces of information, transmitted without change by agents that obey fixed rules about how and with whom they should communicate. We therefore wish to develop a much more realistic simulation environment in which agents do not simply “accept” and “transmit” information, but have to learn its meaning via repeated exposure and communication with others, who similarly learn what information or agents to trust during the process.

A first prototype of such a simulation [**Van Overwalle & Heylighen, 2006**], in which agents are represented as simple neural nets connected by evolving relations of trust, has already been shown to successfully replicate the results of several social psychology experiments that investigated phenomena such as conformity, group polarization, and the emergence of norms. This simulation environment will be greatly extended, with many more agents, with more sophisticated cognitive capabilities, including in-built goals or values, and with a more fine-grained control over the social interactions between agents, supporting various types of social networks and variable subgroup geometries. This will allow us to investigate the different types of cultural dynamics that arise in a differentiated and adaptive population of communicating cognitive agents.

In a second stage, the more interesting situations appearing in the simulation will be re-enacted in a population of hardware agents, i.e. autonomous robots capable of communication and learning. Since these robots will moreover have to cope with a physical environment including the various obstacles and communication problems this brings about (according to the philosophy of situated and embodied cognition), the results of the hardware simulation will tell us more about how robust our dynamical model would be in a realistic environment.

In a third type of approach, a selected set of dynamical situations will moreover be re-enacted in a laboratory situation with human subjects. Because of practical limitations, such re-enactment can only involve a relatively small number of people, interacting according to a relatively simple protocol for a relatively short time. As such the results may tell us less

about the large-scale and long-term dynamics of culture than the software simulations. But as they involve real people with much more sophisticated cognitive and affective capabilities, and much more experience of the real world, a successful replication of the simulation results will give us additional confidence in the robustness of the model. On the other hand, if the results of the software simulation fail to be replicated in either the robotic or human experiments, we will investigate in detail which factors made the difference, and try to incorporate these factors into the software simulation, and if necessary into the underlying theoretical framework.

In a final approach, we will investigate the propagation of memes “in the wild”, i.e. in real populations that are not manipulated by us. For this we can use an ethnographic methodology, observing and documenting what happens in different circumstances where new memes are introduced into an existing cultural setting. This allows for the observation of the effects of various environmental factors that we may not have anticipated, and that are absent in the more artificial and restricted laboratory situations. If such factors are detected, we can further explore their effects by including them in our software and hardware simulations and laboratory experiments. In this way, the overall model will emerge from the interaction between four complementary methodologies: theoretical development, simulation, experiments and field observations.

## **B.2 Relevance to the objectives of NEST**

The present project has all the basic features that characterize the NEST programme in general, being:

- highly *innovative*: no one yet has studied the problem of meme propagation and evolution in an integrated way, combining theoretical models with software and hardware simulations, field observations, and controlled experiments
- high *risk*: it is quite possible that our initial hypotheses turn out to be incorrect or trivial, or that the different approaches yield contradictory or inconclusive results
- high *impact*: if successful this project may revolutionize the way cultural propagation and innovation is understood, while proposing a number of concrete guidelines for controlling the spread of beneficial or dangerous memes (see B.3)
- highly *interdisciplinary/multidisciplinary*: we draw on expertise and ideas from at least cognitive science, biological evolution, sociology, policy studies, social psychology, computer science, ethnography, and marketing, while aiming at an integrated theory that describes the propagation of cultural traits between intelligent agents.

Moreover, the proposal directly addresses the specific themes promoted by the NEST Pathfinder initiative on *Cultural Dynamics*. Quoting the reference document, our proposal focuses on “the ways in which culture and cultural traits are transmitted, and the possibilities these processes allow for influencing cultural developments”. Moreover, our proposal specifically integrates several approaches suggested by the reference document: social science and anthropology, cognitive science, evolutionary models, network analysis and related fields, such as virus epidemiology, and computer simulation. Our research is “not solely empirical”,

but “aims to make conceptual and analytical advances which also have the potential for generalisation”, and to develop “new mechanisms and assessment methodologies to predict cultural dynamics more effectively in multi lateral cross cultural research”. Some of the broader questions it addresses are how marketing and public policy may influence cultural traits, in how far cultures may be resistant to invasion by new cultural traits (memes), how culturally transmitted traits influence the beliefs of individuals and groups, and why certain cultural traits (memes) are successful and others are not.

### **B.3 Potential impact**

The detailed model of cultural dynamics that we wish to develop via theoretical reasoning, software and hardware simulation, observations, and experiments holds out great promises for a better understanding and control of fundamental social problems that depend on the propagation and evolution of cultural traits.

A first basic result that should come out of this research is a concrete and reliable list of criteria that characterize successful memes, i.e. ideas or cultural traits that propagate widely and easily across large populations. This would allow us not only to recognize such memes, but to some degree to design or improve them.

The ability to create successful memes is the Holy Grail of marketing research [Godin, 2002], which is constantly on the look-out for techniques to create a “buzz” and have their publicity message or brand name [Marsden, 2002; Marsden et al., 2005] become as widely known as possible. This particular application will be explored in workpackage 6 of the proposal.

Another application of these principles lies in public education. For example, if the government makes a campaign to convince people to stop smoking or to wash their hands with soap (the subject of workpackage 5), it would be very useful to have the campaign designed according to sound memetic principles. This should take into account both the characteristics of the message itself (e.g. being sufficiently simple and salient), of the intended audience (e.g. being consistent with what the audience already believes, while being sufficiently novel to attract their attention), and of the way it is transmitted (e.g. having the meme expressed in a salient medium by people considered trustworthy).

Memetic selection criteria can be applied not only positively, to help spread a beneficial idea, but negatively, to monitor and control possibly harmful memes. Examples are the idea that it is cool to smoke, false rumours and scares that may promote panic or accentuate social prejudice, fundamentalist ideologies that incite hatred, pseudosciences, and dangerous superstitions, such as the belief that you can cure your AIDS by having sex with a virgin. A better understanding of memetic dynamics may help us to understand how such “mind viruses” [Dawkins, 1993; Brodie, 1996] arise and spread. It may moreover help us to “immunize” the population by educating them beforehand about basic memetics, so as not to be misled by apparently plausible, but fundamentally misleading cults, fads and superstitions.

A second basic result of our research should be a complex dynamical model of the interactions between individuals, groups, and the memes they carry. This should allow making

longer term predictions about the interactions between different groups and subcultures within the larger European and global society. An example of such dynamics, the mutations that policy ideas undergo when they are transferred between countries, will be explored in workpackage 4.

A crucial issue in this regard is whether minority cultures will eventually be assimilated into the majority, or on the contrary become polarized, asserting their divergent habits and beliefs ever more forcefully [Van Overwalle & Heylighen, 2006]. Two concrete examples are minority languages, such as Gaelic, where there is a tendency for the subculture to slowly be erased by the majority culture, and the culture of Islamic immigrants in Europe, where there is a tendency towards polarization in the sense of increased radicalism. Neither complete assimilation nor polarization are very desirable outcomes, but at first sight they seem like the most likely results of the self-reinforcing dynamics created by the pressure to conform to the group one has most contact with. A more detailed model of cultural dynamics may help us to find a middle way, and to pinpoint the crucial factors that will steer the dynamics in one direction rather than another.

On the largest scale, such a model may also tell us under which conditions all local cultures, including the European, may become assimilated into one global culture, and what could be done to still preserve sufficient cultural diversity.

#### **B.4 The consortium and project resources**

##### Participating teams and key people

- VUB: Evolution, Complexity and Cognition research group, Vrije Universiteit Brussel, Belgium, led by Francis **Heylighen** (coordinator), with Frank **Van Overwalle**
- UoN: ASAP Research Group, University of Nottingham, UK, led by Natalio **Krasnogor**
- TUD: Technical University of Delft, Netherlands, led by Martin **de Jong**
- LSHTM: Behaviour Change Programme, London School of Hygiene and Tropical Medicine, United Kingdom, led by Robert **Aunger**
- LSE: London School of Economics, UK, led by Paul **Marsden**

The team leaders of this consortium are recognized experts in the emerging domain of memetics/cultural evolution. They are all members of the editorial board of the peer-refereed, international *Journal of Memetics - Evolutionary Models of Information Transmission*, which was founded in 1996 as the first (and still the only) journal in its domain. According to Google Scholar, some 20% of the most cited papers on memes or memetics were published in this journal, while several of the other most cited publications were authored by consortium members [e.g. **Marsden**, 1998; **Heylighen**, 1992; **Aunger**, 2003], or appeared in books [e.g. **Aunger**, 2001; **Krasnogor** et al., 2004] edited by them. **Heylighen** is the present editor-in-chief and one of the founding editors of the Journal, while **de Jong** and **Marsden** have previously performed the function of managing editor. Together, the consortium members cover the broad spectrum of disciplines that are most relevant to the study of cultural evolution.

## Vrije Universiteit Brussel (Brussels Free University)

The Vrije Universiteit Brussel (VUB) is a medium-sized (about 10,000 students and over 1000 academic staff) Dutch-speaking university with a strong research tradition, situated in the capital of the European Union. The different research groups and departments at the VUB have in the last 20 years successfully organized and participated in dozens of European projects and networks. The Brussels Free University (VUB together with its French-speaking sister university ULB, with which it shares the same campus) is ranked 54 in the world university rankings of the THES, which is the fifth highest score in continental Europe.

The present proposal will be coordinated by ECCO, the Evolution, Complexity and COgnition group, a recently formed transdisciplinary research center at the VUB. The members of ECCO (4 professors, 3 PostDocs, and about 15 PhD students) come from a wide variety of backgrounds, from physical science and computing to the social sciences and humanities. ECCO's research focuses on the evolution of complex, intelligent organization: how does a collection of interacting agents self-organize so as to develop a social and cognitive structure? We tackle this general issue through a number of more concrete research projects, addressing various theoretical aspects and practical applications, including computer simulations and psychological experiments. ECCO members have published hundreds of papers and books on these subjects, and are regularly adding new working papers to their website (<http://ecco.vub.ac.be>). Over the past twenty years, ECCO members have organized about a dozen international conferences in the domain. We moreover publish the electronic Journal of Memetics - Evolutionary Models of Information Transmission.

Francis **Heylighen**, the director of ECCO, is a research professor affiliated with the interdisciplinary Center Leo Apostel at the Vrije Universiteit Brussel. His research is focused on the self-organization and evolution of complex, cognitive systems, which he approaches from a cybernetic perspective. **Heylighen** has authored over 90 scientific publications, including a monograph and four edited books. He is editor of the Principia Cybernetica Project, whose well-known, encyclopedic website he administers since 1993. He is editor-in-chief of the Journal of Memetics, and editorial board member of Informatica, Entropy, and the Journal of Happiness Studies. His work has been cited some 1000 times in scientific papers and some 60,000 times on the web as a whole (according to Google). Articles about his work have appeared among others in New Scientist, Frankfurter Allgemeine Zeitung, Die Zeit, Le Monde, and the Washington Post. He is a Fellow of the World Academy of Art and Science, and his biography has been listed in Who's Who in the World and other international directories. His publications include:

- Heylighen** F. & Campbell D.T. (1995): "Selection of Organization at the Social Level", *World Futures: the Journal of General Evolution* 45, p. 181-212.
- Heylighen** F. (1999): "Collective Intelligence and its Implementation on the Web: algorithms to develop a collective mental map", *Computational and Mathematical Organization Theory* 5(3), p. 253-280.
- Heylighen**, F. 1997. Objective, subjective and intersubjective selectors of knowledge. *Evolution and Cognition* 3,1:63-67.

- Heylighen F.**, Bollen J. & Riegler A. (ed.) (1999): *The Evolution of Complexity* (Kluwer Academic, Dordrecht).
- Van Overwalle F. & Heylighen F.** (2006): “Talking Nets: A Multi-Agent Connectionist Approach to Communication and Trust between Individuals”, *Psychological Review* (in press)

Frank **Van Overwalle** is a full professor affiliated with ECCO and the Department of Psychology at the Vrije Universiteit Brussel. Frank **Van Overwalle** has authored over 40 peer-refereed scientific publications. His recent research focuses on artificial neural network models of various phenomena in the domain of social cognition at large, to demonstrate the common cognitive processes underlying many social findings. This has resulted in several publications in top-ranking journals such as *Psychological Review* and *Personality and Social Psychology Review*. He is a member of the Royal Flemish Academy of Art and Science’s committee of Psychology, the American Psychological Association, and the executive board of the Belgian Federation of Psychologists (BFP). He is a past secretary-general and president of the Belgian Association of Psychological Science (BAPS), and is in the editorial board of the *European Journal of Social Psychology* and *Psychologica Belgica*. His publications include:

- Van Overwalle, F. & Siebler, F.** (2005). A Connectionist Model of Attitude Formation and Change. *Personality and Social Psychology Review*, 9, 231–274.
- Van Overwalle, F., & Labiouse, C.** (2004) A recurrent connectionist model of person impression formation. *Personality and Social Psychology Review*, 8, 28–61.
- Van Rooy, D., **Van Overwalle, F.**, Vanhoomissen, T., Labiouse, C. & French, R. (2003). A recurrent connectionist model of group biases. *Psychological Review*, 110, 536-563.
- Van Overwalle, F. & Jordens, K.** (2002). An adaptive connectionist model of cognitive dissonance. *Personality and Social Psychology Review*, 6, 204–231.
- Van Overwalle, F.** (1998) Causal explanation as constraint satisfaction: A critique and a feedforward connectionist alternative. *Journal of Personality and Social Psychology*, 74, 312-328.

## University of Nottingham

The Automated Scheduling, Optimisation and Planning (<http://www.asap.cs.nott.ac.uk/>) research group and the Interdisciplinary Laboratory are two of four main research groupings within the School of Computer Science and IT at the University of Nottingham. ASAP has been carrying out innovative research into the development and investigation of meta-heuristic, machine learning and artificial intelligence techniques on a range of problems for more than 10 years. It has been at the forefront of research in the area during this period and is internationally recognised within the optimisation and evolutionary computing community for its work. ASAP is funded from a variety of sources including the UK’s EPSRC, ESRC, BBSRC, TCD, and the EU and a variety of commercial organisations. The group currently has 9 academic members of staff, 1 industrial fellow, 17 research assistants, 30 PhD students and two administrators. ASAP personnel have many years of research and commercial experience. Members of ASAP also lead and participate in the Inter-disciplinary Optimisation Laboratory (see its site at <http://www.asap.cs.nott.ac.uk/iol/>) in which this project will be located.

Dr. Natalio **Krasnogor** (<http://www.cs.nott.ac.uk/~nxk/>) is a Lecturer within the ASAP group at the University of Nottingham. He has established and co-chaired the series of international Workshop on Memetic Algorithms (WOMA). He is the holder of a US patent for an Internet related technology. Dr **Krasnogor** has published more than 50 papers on Metaheuristics, Bioinformatics, Evolutionary Computation and Natural computation. He has served as reviewer for various international conferences and prestigious journals. He was a guest editor of several special issues of journals dedicated to Memetic Algorithms, and co-editor of the first book to be published that deals exclusively with Memetic Algorithms. He is editor of the International Journal of Computational Intelligence, and the Journal of Memetics. He is also associated editor for the Journal of Evolutionary Computation and committee member of the Society for the Study of Artificial Intelligence and the Simulation of Behaviour. He is a principal investigators or co-investigator in grants totalling in excess of 3 million Euros. He is editor of the upcoming book “Systems Self-Assembly: multidisciplinary snapshots” to be published by Elsevier's “Studies in Multidisciplinarity” series. Some other references of interest are:

“Recent Advances in Memetic Algorithms”. N. **Krasnogor**, W.E. Hart and J.E. Smith. Book in the series Studies in Fuzziness and Soft Computing, 2004, Springer .

“A Study on the use of “Self-Generation” in Memetic Algorithms”. N.**Krasnogor** and S. Gustafson. *Natural Computing* 3 (1): 53-76, 2004

“Real-Coded Memetic Algorithms with Crossover Hill-Climbing”. M. Lozano, F. Herrera, N. **Krasnogor** and D. Molina. *Evolutionary Computation* Vol 12(2) 273-302, 2004.

“A Tutorial for Competent Memetic Algorithms: Model, Taxonomy and Design Issues”. N. **Krasnogor** J.E. Smith. *IEEE Transactions on Evolutionary Computation*, 2005

## London School of Hygiene & Tropical Medicine

The London School of Hygiene & Tropical Medicine (LSHTM) is a global leader in public health. Within LSHTM, the Hygiene Centre (Director: Dr Val Curtis) is a thriving group comprising engineers, anthropologists, business specialists, consumer researchers, epidemiologists and other technicians with 25 years of experience researching household hygiene, sanitation, water supply and behaviour change. LSHTM advises governments and agencies including DFID, Unicef, the World Bank, and NGOs in handwashing and household water management, with an annual grant income of over £1 million. The Hygiene Centre designs, manages and evaluates national programmes all over the world designed to increase hygienic behaviours and thus prevent the diarrhoea and respiratory infections which are the dominant killers of children worldwide.

Robert **Aunger** is Senior Lecturer in Evolutionary Public Health in the Hygiene Centre, and Director of its Behaviour Change Programme. He has a Master's degree in Urban Planning and a PhD in biological anthropology from UCLA. He worked as a post-doctoral fellow at the University of Chicago in culture and mental health and at King's College Cambridge in evolutionary psychology. He has taught at UCLA, Northwestern University, the University of Chicago, the University of Cambridge and LSHTM. Early in his career, he spent two years in central Africa studying the cultural transmission of food taboos among pygmies and their

horticulturalist neighbours. He is the editor of one book, and author of two others, as well as numerous papers in leading journals in anthropology, biology and psychology. He is a member of the editorial board of the *Journal of Memetics*. He has appeared on both radio and television discussing his work. His publications include:

- Aunger, Robert**, ed. (2001). *Darwinizing Culture: The Status of Memetics as a Science*. Oxford University Press. 242 pgs. [Japanese translation (Sangyo Tosho) in 2004]
- Aunger, Robert** (2002). *The Electric Meme: A New Theory of How We Think*. Free Press (Simon and Schuster). 400 pgs. [Spanish translation (Paidós) in 2004; Chinese translation forthcoming from CITIC Publishing]
- Aunger, Robert** (2002) "Exposure versus susceptibility in the epidemiology of 'everyday' beliefs." *Journal of Cognition and Culture* 2 (2):113-154.
- Aunger, Robert** (2003). "Cultural transmission and diffusion," in *Encyclopedia of Cognitive Science*, ed. by Lynn Nadel. London: MacMillan.
- Aunger, Robert** (2004). "Memes," in *The Social Science Encyclopedia* (3rd ed), ed. by Adam Kuper and Jessica Kuper. London: Routledge.

### Technical University of Delft

With approximately 13,000 students and an academic staff of 2,100 (including 200 professors), TU Delft is the largest and most comprehensive university of engineering sciences in the Netherlands. TU Delft's research portfolio is clustered around thirteen interdisciplinary technological themes including Computational Science and Engineering, Mechatronics and Microsystems, Nanotechnology, Sustainable Industrial Processes and Water Management. Each year, the University's cumulative research results in an average of 185 PhD dissertations, and over 4,000 publications in scientific journals.

The Faculty of Technology, Policy and Management, where this project will be carried out, focuses on sustainable solutions to complex socio-technical problems through internationally oriented education and research. It is doing this through analysing the structure and operation of technical multi-actor systems and by developing intervention strategies, practices and instruments for designing and improving systems of this kind.

**Martin de Jong** is an Associate Professor of Public Management at the Section of Policy, Organisation and Management of the Faculty of Technology, Policy and Management and the Director of the International Master Programme of Engineering and Policy Analysis. He holds a master's degree in public policy from Erasmus University of Rotterdam and Leiden University and a PhD from Delft University of Technology. He has held assistant professor position at the the universities of Delft and Amsterdam and has been a visiting scholar to George Mason University (USA) and Helsinki University of Technology. He has developed extensive collaboration in research and education with institutes in China, Australia and Indonesia. He has published extensively in the field of public policy, and more specifically cross-national institutional comparison, cross-national policy transfer, infrastructure policy and evolutionary theory applied to the administrative sciences. He is a member of the editorial board of the *Journal of Memetics* and was its managing editor in the years 2002-2004. His key publications include:

- Mayer, I. S., L. Carton, M. **de Jong**, M. Leyten and E. Dammers (2004), Gaming the Future of an Urban Network, in: *Futures* 36 (3), March 2004, pp 311-333.
- Mayer I. and M. **De Jong** (2004): Combining GDSS and Gaming for Decision Support, *Group Decision and Negotiation*, 13: 223-241, April 2004.
- De Jong**, Ma. (2004): The Pitfalls of Family Resemblance; Why transferring Planning Institutions between 'Similar Countries' is Delicate Business, in: *European Planning Studies*, Vol. 12, No, 7 (November), pp. 1055-1068.
- De Jong**, M. and H. Van der Voort (2004): Evolutionary Theory in the Administrative Sciences: Introduction, in: De Jong, M., H. Van der Voort and R. Van Wendel de Joode (2004): Special Issue on Evolutionary Theory in the Administrative Sciences, in: *Knowledge, Technology and Policy* 16: 4, pp. 16-29.
- De Jong**, M., K. Lalenis & V. Mamadouh (eds) (2002), *The Theory and Practice of Institutional Transplantation; Experiences with the Transfer of Policy Institutions*, Geo Journal Library, Kluwer Academic Publishers

## London School of Economics

Part of this project will be carried out at Enterprise LSE, a wholly-owned subsidiary of the London School of Economics (LSE). Enterprise LSE enables and facilitates the application of LSE expertise and intellectual resources, providing a wide range of commercial development services, from tailor-made executive programmes for leading businesses and public sector organisations. We are able to draw upon the full quality and depth from over 18 departments (including but not limited to finance, economics, law, management and public policy) and 20 interdisciplinary research centres. We have a proven track record of working with members of the School to deliver successful outcomes to clients and business partners ranging from small-scale individual consultancy assignments up to more complex projects involving large interdisciplinary teams.

**Paul Marsden** has a PhD in Social Psychology (2000) from the University of Sussex (UK), with a thesis Thesis on Media Contagion (Copycat and word of mouth effects of media communication). He presently works as associate consultant at Enterprise LSE, researching the economics of buzz - the impact of word of mouth advocacy on business growth. Paul co-founded online research firm Brainjuicer, and has worked as associate director for TNS, research director for Brand Genetics and research consultant for NOP (now GfK). He is also a founding shareholder in Spheeris, France's first buzz marketing agency. Author of *Connected Marketing: The Viral Buzz and Word of Mouth Revolution*, and the *NOP Guide to Internet Research*, Paul is on the advisory boards of the Word of Mouth Marketing Association and the Viral and Buzz Marketing Association. His publications include:

- Marsden P.** & J. Kirby: *Connected Marketing: The Buzz, Viral and Word of Mouth Revolution* (London: Elsevier) (2005)
- Marsden P.:** A Deadly Contagion: The Risk of Copycat Terrorism, *The Psychologist*: March 2005 vol. 18 no. 3.
- Marsden P.:** Brand Positioning: Meme's the Word, *Marketing Intelligence and Planning*: Jan 2002.
- Marsden P.:** What Healthy-Living Means: Trialing a New Qualitative Research Tool, *International Journal of Market Research*: June 2002
- Marsden P.:** Memetics & Social Contagion: Two Sides of the Same Coin? *Journal of Memetics: Evolutionary Models of Information Transmission* (1998 Vol. 2)

## Requested funding

The main items determining the overall budget (form A3) requested to realize this project are:

- purchase of data and publications
- computer and communication equipment
- data collection (surveys, ...) and processing (mainly salaries for assistants – students or technical)
- payment of volunteers to participate in the experiments
- research of the models and their fit to the data (mainly researcher time)
- travel between the locations of the groups and exchange of personnel (visits between a few days and a few weeks).
- management (payment of administrative staff time)

The budget per group per year is actually relatively low: about 80K euro /year, and will have to be supplemented by local funds from the participating institutions. In fact the typical size of the teams involved is of the order of 2-6 researchers, who will invest part of their time in directing and supervising the project without being paid from the requested funding. The bulk of the funding will go to pay PhD scholarships or wages for new research assistants to carry out the collection and analysis of data, and survey of the literature. Each of the groups has a basic infrastructure (communication, computing, office space, secretarial support, visitor arrangements) typical for academic institutions, which will be used for a baseline support of the project. The main need for additional infrastructure will be in computing facilities, given the amount of data that needs to be harvested and processed. Thus, while by no means overflowing, the present budget will give us the necessary extra manpower and facilities to tackle this ambitious project.

## B.5 Project management

This section describes the structures, responsibilities and lines of communication on which the Management WP is based. The management methodology is designed to provide close monitoring and reporting, while imposing the lightest burden on the research teams whose main purpose is to implement the work described in the proposal.

The Project Co-ordinator (Francis **Heylighen**, VUB) will be the central moderator in the financial and administrative issues with the European Commission and the Consortium members. VUB will provide the project coordination and financial management services, including liaison with the EC and the project officers, and will represent the consortium at Concertation meetings. The communication language among the project partners and with the European Commission will be English.

## Project Steering Committee

The project will have a single management body, the Project Steering Committee (PSC) that will take care of both the management coordination, and scientific and technical coordination. The responsibilities of the different partners will be made explicit in the Consortium Agreement, to be signed before the beginning of the project.

The PSC will be composed of five members with voting rights, (F. **Heylighen**, N. **Krasnogor**, R. **Aunger**, M. **de Jong**, P. **Marsden**) representing each of the five consortium partners. Each partner will also appoint a deputy to be nominated upon the project start. The PSC is responsible for:

- supporting the Co-ordinator in fulfilling obligations towards the European Commission
- ensuring that all work meets the requirements and standards of quality
- providing project management in relation to the activities of the WPs on technical, financial and/or exploitation/dissemination issues, as applicable
- reviewing and proposing budget transfers in accordance with the Contract and the annual Implementation Plan
- proposing changes in work sharing and budget,
- agreeing on press releases and joint publications by the Parties with regard to the Project.

The PSC is the only body that can take contractually binding decisions on the project's behalf, and will have clear voting rules and regulations. Ordinary PSC meetings will coincide with consortium meetings; extraordinary PSC meetings shall be called by two Consortium members, at least. In general, physical consortium meetings will take place at least once a year, although additional meetings can be held for project reviews, key milestones, etc.

The project co-ordinator is the single point of contact between the European Commission and the Consortium. In this function the Co-ordinator shall:

- prepare, with the support of the members of the Project Co-ordination Committee, the reports and project documents required by the European Commission, and
- ensure prompt delivery of all software and data identified as deliverable items in the Contract or requested by the European Commission for reviews and audits.

The Co-ordinator is responsible for the following tasks and functions:

- overall management of the Project with the support of a project administrator,
- chairing the Project Co-ordination Committee, and
- preparation of the meetings and decisions of the Project Co-ordination Committee.

The workpackage leaders are in charge of the coordination and performance of work packages. Specific tasks for workpackage leaders are to:

- Ensure accomplishment of the technical objectives of the workpackage.
- Log decisions related to the progress of the workpackage.
- Coordinate the production of the deliverables;
- Flag insufficient quality or unacceptable delays in the contribution of individual members.

- Collaborate with the PSC and the project manager in order to ensure the value and convergence of workpackage results relative to the overall project objectives.

### Management support tools

To avoid needless travel and costs, the consortium will make extensive use of communication technology to support the project management, including:

- A Web-based collaborative software system. If the project is approved, a project workspace will be constructed where partners exchange documents and data relevant to the project. We will install a sophisticated collaboration software that provides a set of tools that help project management: document management functions (including versioning), calendar and meeting functions, email, newsgroups, etc. Such tools have proved their effectiveness in many national and international collaborations.
- An e-mail discussion list, where partners exchange information, ideas and opinions. The list may be also used as a bi-lateral communication information tool between partners, keeping the other partners informed of the progress in project tasks.
- Periodic video/telephone conferences, where consortium members discuss project issues and project progress whenever needed.

### Management of Knowledge and Intellectual Property

All scientific results and software produced by the project will be considered to belong to the public domain, and will be disseminated via traditional scientific publication channels (journals, books, conference presentations, ...). We will moreover create a public project website, where all the major results, data, public reports and simulation environments will be made available to the public from the moment they are ready.

## **B.6 Detailed Implementation plan**

The project has been split up in 6 research workpackages (WPs), and one management WP, which are each led by one of the participating groups. We have planned the work in such a way that the different WPs are divided according to methodology or setting, e.g. software simulations, laboratory experiments, or observations ‘in the wild’. The WPs will therefore all run in parallel, looking at different aspects of the same problem from different angles. The theoretical WP1 will be responsible for integrating all the results, and can be seen as the central communication channel through which the other, more concrete WPs interact. Thus, insights generated in one of the more concrete WPs (e.g. the robotic simulation or business games) will be incorporated in the developing theoretical model, which will in turn suggest issues to investigate or factors to take into account for all the other WP where these factors may be relevant.

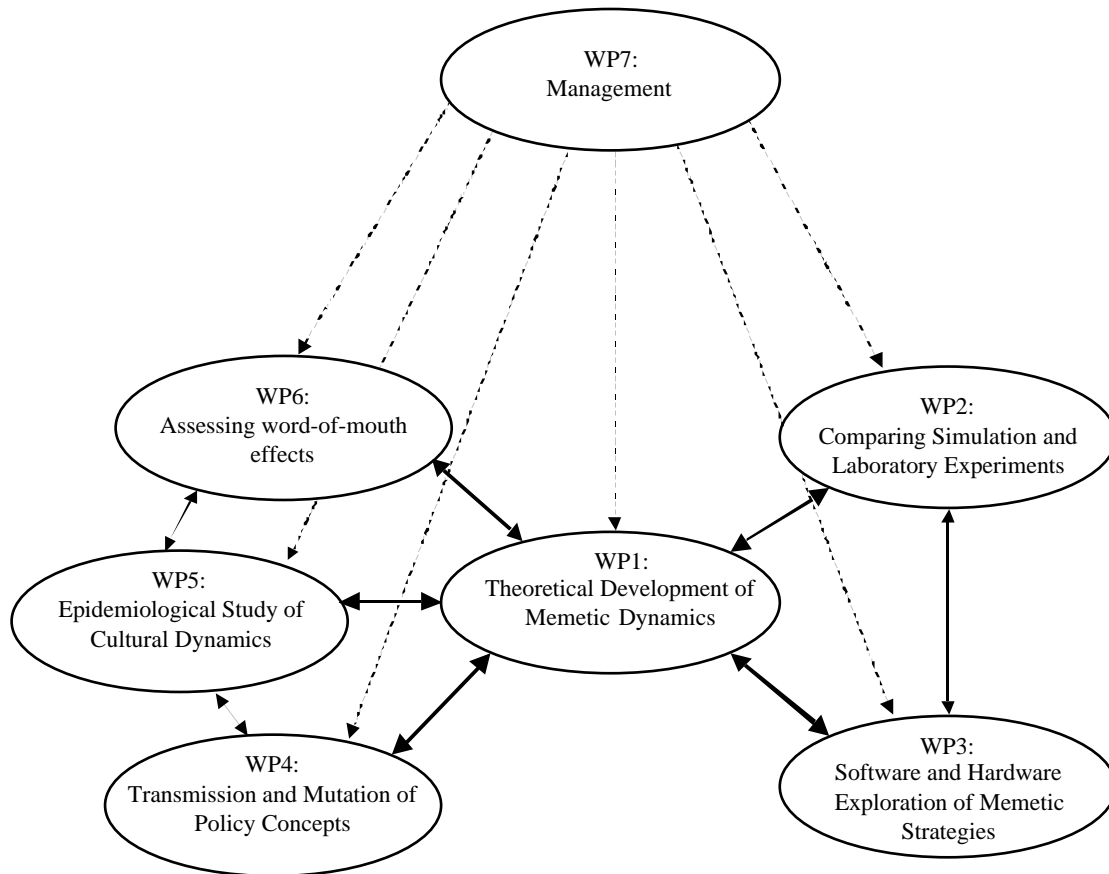
For example, suppose that during WP4, which investigates policy transfer via business games, the observation is made that people lacking self-confidence tend to transfer ideas in a

markedly more literal fashion, with less variation or personal contribution. In that case it will be worth including the “self-confidence” factor in the general model (WP1), which in turn may suggest that this factor is also explored in an on-going laboratory experiment on transmission of stories (WP2), and perhaps even that an equivalent of “self-confidence” is programmed in the robotic simulations (WP3), with some robots being more inclined to slavishly follow what others communicate to them, and others more inclined to include their personal experience.

Given the relatively short duration (3 years) of the project, for such cross-fertilization between parallel approaches to be successful, communication of observations, hunches and results between all the WPs and group members must be fast and efficient. This is made possible by the Internet-based management support tools that we sketched in the previous section, which make sure that all team members have at all moment access to all the results of other teams to date, and are immediately warned of any significant new development or idea. In addition, the team members will spend extensive time in traditional meetings (as organized by the management WP7) where all scientific ideas will be discussed in depth, so as to come as much as possible to a consensus about the developing synthetic framework.

### Graphical presentation of the components

The following diagram shows the interdependencies between the different workpackages. As noted, WP1 is the central communication point via which insights, proposals and results are exchanged between the different workpackages. In addition, there is a strong interaction between WP2 and WP3, which both work with computer simulations, albeit that the one of WP2 is directed at simulating actual people communicating in a laboratory situation, whereas WP3 wishes to explore memetic evolution in a more abstract environment, where software or hardware agents communicate directly without the mediation of human language or conventions. There will also be less strong interactions between the three observational studies of cultural propagation and evolution, WP4, WP5 and WP6, which investigate essentially the same problem in three quite different settings.



## Work planning

Here is a Gantt chart showing the timing of the different WPs and their milestones :

month	0/start	3	6	9	12	15	18	21	24	27	30	33	end
WP1					M1.1				M1.2				M1.3
WP2			M2.1						M2.2				M2.3
WP3					M3.1				M3.2		M3.3		M3.4-5
WP4			M4.1				M4.2			M4.3			M4.4
WP5			M5.1		M5.2				M5.3				M5.4
WP6			M6.1		M6.2		M6.3						
WP7	M7.1				M7.2				M7.3				M7.4

**STREP Project Effort Form****Full duration of project**

(insert person-months for activities in which participants are involved)

Project acronym - MEMDYN

	VUB	UoN	TUD	LSHTM	LSE	TOTAL PARTICIPANTS
Research/innovation activities						
WP 1	36	8	6	10	6	66
WP 2	36	10	0	4	6	56
WP 3	6	36	0	2	2	46
WP4	6	0	36	2	6	50
WP 5	6	0	2	36	2	46
WP 6	2	0	2	0	12	16
Total research/innovation	92	54	46	54	34	280
Consortium management activities						
Management (WP 7)	18	1	1	1	1	22
<b>TOTAL ACTIVITIES</b>	<b>110</b>	<b>55</b>	<b>47</b>	<b>55</b>	<b>35</b>	<b>302</b>

### Workpackage list

Work-package No1	Workpackage title	Lead contractor No2	Person-months3	Start month4	End month5	Deliverable No6
1	Theoretical development of memetic dynamics	VUB	66	0	36	D1.1-2
2	Comparing simulation and laboratory experiments on memetic propagation	VUB	56	0	36	D2.1-3
3	Software and Hardware Exploration of Memetic Strategies	UoN	46	0	36	D3.1-5
4	Transmission and mutation of policy concepts through cross-national institutional transfer	TUD	50	0	36	D4.1-4
5	An epidemiological study of cultural dynamics in the 'wild'	LHSTM	46	0	36	D5.1-4
6	Assessing word of mouth effects	LSE	16	0	18	D6.1-2
7	Management	VUB	18	0	36	D7.1-2
	<b>TOTAL</b>		302			

1 Workpackage number: WP 1 – WP n.

2 Number of the contractor leading the work in this workpackage.

3 The total number of person-months allocated to each workpackage.

4 Relative start date for the work in the specific workpackages, month 0 marking the start of the project, and all other start dates being relative to this start date.

5 Relative end date, month 0 marking the start of the project, and all ends dates being relative to this start date.

6 Deliverable number: Number for the deliverable(s)/result(s) mentioned in the workpackage: D1 - Dn.

### Deliverables list

Deliverable No7	Deliverable title	Delivery date 8	Nature 9	Dissemination level <sup>10</sup>
D1.1.	a report on memetic selection criteria	12	R	PU
D1.2.	a report on the interactions between memes, agents and social system	24	R	PU
D2.1.	A report describing the simulation results under different conditions and parameter values.	24	R	PU
D2.2.	A report describing the experimental results, and their agreement/disagreement with the simulation.	24	R	PU
D2.3.	A multi-agent software system allowing the simulation of culture development.	36	D	PU
D3.1.	Simulation of behaviour protocols, implemented as computational algorithms, to simulate meme propagation and processing in both virtual and robotic agents for a given virtual or robotic setting	36	D	PU
D3.2.	Simulation of behaviour protocols, implemented as computational algorithms, to self-generate cultural variants for a given virtual or robotic setting	36	D	PU
D3.3.	Machine learning & Artificial Intelligence protocols, implemented as computational algorithms, that will allow virtual and robotic agents to learn ontologies describing new social and reality laws.	36	D	PU
D3.4.	Complexity science quantitative analysis of D3.1,D3.2 & D3.3	36	R	PU
D3.5.	optimisation strategy to enhance virtual and robotic agents cultural flexibility	36	O	PU
D4.1.	Theoretical survey and an analytical working models on the principles and mechanisms of cultural transmission in the world of public policy	6	R	PU
D4.2.	Report with four case studies on policy transfer and a thorough analysis of how the cultural transmission and mutation intersected with actor behaviour and interaction	18	R	PU
D4.3.	Social simulation model suitable to test how policy transfer operates in four different national institutional environments .	28	R	PU
D4.4.	Report on outcomes of gaming-simulation with recommendations	36	R	PU

7 Deliverable numbers in order of delivery dates: D1 – Dn

8 Month in which the deliverables will be available. Month 0 marking the start of the project, and all delivery dates being relative to this start date.

9 Please indicate the nature of the deliverable using one of the following codes:

- R** = Report
- P** = Prototype
- D** = Demonstrator
- O** = Other

10 Please indicate the dissemination level using one of the following codes:

- PU** = Public
- PP** = Restricted to other programme participants (including the Commission Services).
- RE** = Restricted to a group specified by the consortium (including the Commission Services).
- CO** = Confidential, only for members of the consortium (including the Commission Services).

D5.1.	Baseline levels of hand-washing awareness and practice in all areas prior to intervention.	6	R	PU
D5.2.	Report on number, date and location of road-shows conducted and reports on intervention methods and materials used.	12	R	PU
D5.3.	reports on handwashing diffusion through Treatment areas 1 and 2	24	R	PU
D5.4.	Final report on the outcomes of the various interventions	36	R	PU
D6.1	Net Promoter Scores for Universities.	6	R	PU
D6.2	Performance data (application levels and pass rates for each university).	12	R	PU
D6.3	Final Report	18	R	PU
D7.1.	Web-based project management tool	4	P	PU
D7.2.	Overall Project Report and financial statement to the EC	36	R	PU

## WP1 Theoretical development of memetic dynamics

<b>Workpackage number</b>	1	<b>Start date or starting event:</b>				0
<b>Participant id</b>	VUB	UoN	TUD	LHSTM	LSE	
<b>Person-months per participant:</b>	36	8	6	10	6	

### Objectives

- To develop an integrated model of how memes propagate and evolve between cognitive agents
- to propose specific factors to be investigated in the other workpackages
- to compare the predictions and implications of this model with the results from the other workpackages, and if necessary adjust the model

### Description of work

This workpackage will elaborate and extend the basic hypotheses formulated in this proposal. It will try to achieve a multi-disciplinary synthesis of ideas about cultural transmission and evolution developed in a variety of specialized domains, focusing on the issues: 1) what characterizes a successful meme?; 2) how do the memes transmitted between cognitive agents change the agents, while being changed by them? This problem will be approached by an extensive study of the literature, to locate related models of cultural propagation and evolution and extract the most useful components from them, and by in-depth discussion of the issues between the key personnel of the consortium, and by the consultation of outside experts (e.g. Dawkins, Blackmore, Boyd, Richerson, Heath, Hull, Kashima, Schaller), most of whom we are already in contact with.

We will try in particular to further extend and clarify our preliminary list of selection criteria that characterize good memes, defining them as accurately as possible, so that they can be easily operationalized in the form of empirical measurements or simulation environments. From these, we will derive predictions about which aspects or elements of a culture or cultural system are likely to survive and spread and which are likely to be eliminated, thus getting a first qualitative understanding of how a complex of memes will change as it undergoes repeated transmission. In a second stage, we will consider the non-linear interactions between memes, individual agents, and the social systems they form. This should result in a more complex model, where the structure of the social network and the agent's neural network is affected by the memes transmitted, and vice-versa.

These models will make a number of concrete predictions about how certain factors (e.g. characteristics of the meme, of the individuals, of their way of interacting) affect the propagation and evolution of cultural traits. Insofar as possible, these factors will be operationalized in the context of each of the other workpackages (e.g. as formal properties of a simulation environment, rules of a management game, or factors influencing a cultural propagation 'in the wild'). This will then allow us to check in how far the empirical results of the other workpackages confirm or refute our theoretical assumptions. If the predictions are refuted, we will reformulate the model to take into account the new ideas suggested by the practical implementation.

### Deliverables

- D1.1 a report on memetic selection criteria
- D1.2 a report on the interactions between memes, agents and social system

### Milestones<sup>11</sup> and expected result

- M1.1 - Month 12: an operationalized model of basic memetic factors
- M1.2 - Month 24: model test results available from other WPs, possibly need to reformulate model
- M1.3 - Month 36: an integrated model of interactions between memes and agents

<sup>11</sup> Milestones are control points at which decisions are needed; for example concerning which of several technologies will be adopted as the basis for the next phase of the project.

## WP2 Comparing simulation and laboratory experiments on memetic propagation

<b>Workpackage number</b>	2	<b>Start date or starting event:</b>				0
<b>Participant id</b>	VUB	UoN	TUD	LHSTM	LSE	
<b>Person-months per participant:</b>	36	10	0	4	6	

### Objectives

- to set up laboratory experiments of memetic transmission in a setting simple enough to be simulated
- to make computers simulations of the experiments
- to compare the results of experiments and simulations

### Description of work

Most empirical observations of cultural propagation, such as those in the following workpackages, take place in settings (e.g. business games or society) that are too complex and rich in details to allow a simple comparison with a formal model of propagation such as those used in computer simulations. However, certain types of psychological laboratory experiments, where the settings are strictly controlled by the experimenter, produce quantitative results that can be accurately compared with those of a computer simulation.

The simplest type of “memetic” experiment is the “Chinese whispers” game, in which a particular message (e.g. a story) is sequentially retold from person to person. By comparing the initial version with the version produced by the last person in the sequence, it is possible to determine which aspects of the story are retained or accentuated, and which are suppressed (see e.g. [Lyons & Kashima, 2001, 2003]). The elements that are amplified during the transmission can be seen as fit memes, those that are eliminated as unfit ones. In this basic set-up we can manipulate various factors, such as the background knowledge that the experimental subjects have, the coherence or novelty of the story, or the relations between the people in the transmission chain, to see which effect they have on the transmission process.

The VUB group has very recently shown [Van Overwalle & Heylighen, 2006] that a computer simulation incorporating some of our basic hypotheses on memetic dynamics can reproduce the results of such an experiment [Lyons & Kashima, 2003], thus confirming the underlying assumptions. In this workpackage, we wish to apply the same methodology to examine many more hypotheses and factors, as proposed by the theoretical model being developed in WP1. For example, one hypothesis is that people will more readily transmit information coming from sources they trust. The trust factor can be easily manipulated in both the experiment and the simulation, after which the effects on transmission can be measured. If the measurement results of simulation and experiment are strongly correlated, the model is confirmed. If not, we will know that something is missing in either the theory or its implementation in the form of a simulation. The advantage of working with a simulation is that it allows us to explore many more values and combinations of the different dimensions that appear important, in order to find situations with particularly clear-cut or interesting results. These can then form the inspiration for setting up a specific experiment to test the predictions.

### Deliverables

- D2.1 - Month 24: A report describing the simulation results under different conditions and parameter values.
- D2.2 - Month 24: A report describing the experimental results, and their agreement/disagreement with the simulation.
- D2.3 - Month 36: A multi-agent software system allowing the simulation of culture development.

### Milestones and expected result

- M2.1 - Month 6: basic design of an experiment/simulation testing theoretical hypotheses
- M2.2 - Month 24: confirmation/refutation of theoretical predictions
- M2.3 - Month 36: final report and updated simulation available

### WP3: Software and Hardware Exploration of Memetic Strategies

<b>Workpackage number</b>	3	<b>Start date or starting event:</b>				Project Month 1
<b>Participant id</b>	VUB	UoN	TUD	LHSTM	LSE	
<b>Person-months per participant:</b>	6	48	0	2	2	
<b>Objectives</b>						
<ol style="list-style-type: none"> <li>1. To investigate and then develop the infrastructure required for the exploration, analysis and design of memetic strategies</li> <li>2. To investigate and then develop the infrastructure required for the exploration, analysis and design of memetic ontological space (i.e. cultural background).</li> <li>3. To investigate and then develop the infrastructure required for the exploration, analysis and design of agents modalities (i.e. events plots, sets of formal rules and regulations, etc) .</li> </ol> <p>These three objectives will be concurrently investigated under two complementary scenarios: (A) agents embodied <i>in silico</i> (e.g. computer simulations, the Internet, etc) and (B) agents embodied <i>in terra</i> (i.e. robotic agents in the physical world)</p>						

<b>Description of work</b>	
First Objective:	
<p>When agents, whether embedded <i>in silico</i> or <i>in terra</i>, go about their business they often encounter situations, other agents and “reality laws” that they must negotiate in order to either achieve their goals or to adapt their goals towards more realistic (e.g. achievable) aims. The situations, other agents involved and the reality laws governing what is and what is not possible are captured within a formal game and ontology. We aim at:</p> <ol style="list-style-type: none"> <li>1. Learning which memes, from a pre-defined set, an agent would use on a <b>given, i.e. fixed, game and ontology</b>. We are interested in understanding what are the memetic processes involved under two different conditions: one in which the memepool is composed by a variety of <i>discrete</i> memes and the other one when the memepool is composed by a <i>continuously distributed</i> or more loosely defined set of <i>fuzzy</i> memes. We will investigate the type of processes that promotes various memetic strategies. Also, we will seek insights on how the cognitive mechanisms of computational and robotic agents affects meme selection. The still raging debate on “nature VS nurture” will be quantitatively investigated by giving both <i>in silico</i> and <i>in terra</i> agents the same cognitive abilities (i.e. the same nature) and placing them in very distinct environments that are ruled by different reality laws. We will research <i>in silico</i> (e.g. computational simulations and internet virtual worlds) and in terra (i.e. Nottingham’s robotic arena) environments. We are also interested in learning how the transition from discrete to continuous memes impacts on the cognitive algorithms, the time-to-fixation of cultural traits in a population of agents and the robustness of the resulting processes. We will implement mechanisms to “up-load” human designed memes to the agents so we can investigate specific games and ontologies.</li> <li>2. The exploration, analysis and design of the memepools themselves, that is, rather than starting with a pre-existent set of discrete or continuous memes agents will self-generate memes for a given social situation and ontology. Various machine-learning paradigms (e.g. evolutionary computation, neural networks, learning classifier systems, etc) will be explored and implemented with the purpose of improving the memetic capacity of the agents and incorporating the theoretical insights produced in the other workpackages of this research programme. It is expected that different learning, exploration, analysis and design mechanisms will be best suited for different meme/ontological scenarios. The mapping of which scenarios require which learning/optimisation mechanism is one of the main goals of this work package. The analysis and data mining of the best memes and the strategies that produced them under a variety of social scenarios will also be studied. Provision for software enabling technologies for meme data mining will be developed. Special attention will be put on the evolution of life-history memes and the comparison of emergent cultural artefacts <i>in silico</i> and <i>in terra</i>.</li> </ol>	
Second Objective:	
<p>Cultural dynamics can be sought to emerge from the interaction of a multitude of agents situated within some referential framework. The previous objective was about investigating what memes and strategies agents should use as to best cope with a given fixed social situation and environment. The second objective of this workpackage is to research the complementary issue of cultural dynamics. That is, we seek to answer the question of what happens when a population of agents finds itself facing a completely new reality or when a given agent moves or is moved to a different game &amp; ontology set up? We aim at investigating:</p>	

3. Optimisation and learning of the ontology(ies) that best describes a social scenario and that allows agents to better capture contextual knowledge about the situations being played and other agent s' memes. That is, this is the complementary aspect of the previous objectives. It is envisioned that a co-evolutionary approach to meme-strategy-ontology creation, acquisition and learning will be of benefit as each one feeds on the other; various co-evolutionary approaches will be investigated (e.g. symbiosis, host-parasite models, etc). The amount of computational expression power (CEP) required to express viable ontologies will be explored in a systematic way. These studies will start with the simplest computational models (e.g. finite automata or equivalent) going all the way up to universal computational devices (e.g. Turing machines or equivalent). The lower and upper bounds on CEP that is required for capturing meaningful and expressive ontologies will be investigated.
4. We will analyse the emergent ontologies in light of the theoretical insights gained in the other workpackages. We will map the relation between the types of ontologies that are generated in the population of agents and the features of the strategic set (see objective 1). Particular attention will be given to those ontologies that while being easier to describe (in a Kolmogorov complexity sense) give rise to rich strategic sets and/or robust memepools. We will implement mechanisms to "up-load" human design ontologies to the agents so we can investigate specific cultural conditions.

Third Objective:

5. We will explore and optimise various interaction modalities for the agents. That is, different ways of evolutionary information transmission will be implemented and investigated following theoretical models developed in other workpackages. Special attention will be put on providing the means by which cooperation, competition, and other social attitudes could be implemented as part of the behavioural repertoire of the agents (e.g. strategy sharing/acquisition, ontology sharing/acquisition, etc). The infrastructure will also allow the undertaking of research aimed at understanding what are the interrelations between agents' memepools, strategies and ontologies, cultural conditions and the emergence of social attitudes. We will investigate the impact of the transfer of information during contests and during cooperative/competitive social settings. In an analogy with the evolutionary stable strategies and developmental stable strategies routinely studied in (evolutionary) game theory we will investigate the conditions under which culturally stable strategies (css) arise. We will implement mechanisms to "up-load" human designed social interaction biases into the agents so we can investigate specific social behaviours as observed in other workpackages from this research programme.

The three objective described before will be repeated for virtual agents embedded in a virtual reality or simulation and with real robots embedded in the physical world. The utilisation of robots is essential as they bring the essential embodiment dimension to the scientific goals posited above. Thus we seek to address the question of whether memetic theory, processes, strategies and ontologies studied for disembodied virtual reality agent's transfer to embodied robots and to what degree that is possible.

### **Deliverables**

- D3.1: Simulation of behaviour protocols, implemented as computational algorithms, to simulate meme propagation and processing in both virtual and robotic agents for a given virtual or robotic setting
- D3.2: Simulation of behaviour protocols, implemented as computational algorithms , to self-generate cultural variants for a given virtual or robotic setting
- D3.3: Machine learning & Artificial Intelligence protocols, implemented as computational algorithms, that will allow virtual and robotic agents to learn ontologies describing new social and reality laws.
- D3.4: Complexity science quantitative analysis of D1,D2 & D3
- D3.5: Illuminated by D4 we will deliver optimisation strategy as to enhance virtual and robotic agents cultural flexibility as implemented by D1,D2 & D3.

### **Milestones and expected result**

- M3.1 - month 12: implemented and tested memetic cultural dynamics in virtual agents and robots for D1
- M3.2 - month 24: implemented and tested self-generation mechanisms for virtual and robotic communities of agents for D2
- M3.3 - month 30: quantitative complexity analysis report for D4
- M3.4 - month 36: implemented and tested machine learning & AI protocols for ontological learning for D3
- M3.5 - month 36: enhanced virtual and robotic cultural dynamics capabilities.

## WP4 Transmission and mutation of policy concepts through cross-national institutional transfer

<b>Workpackage number</b>	4	<b>Start date or starting event:</b>				Project Month 1
<b>Participant id</b>	VUB	UoN	TUD	LHSTM	LSE	
<b>Person-months per participant:</b>	6	0	36	2	6	

### Objectives

The overall objective is to describe and explain the principles and mechanisms behind conceptual transmission in processes of cross-national policy transfer by means of theoretical exploration, empirical case study and verification through social gaming-simulations. The specific aims are:

- To cover the evolutionary principles and mechanisms underlying cross-national policy transfer.
- To devise an analytical model in which the state-of-the-art thinking on transmission and mutation of problem-solving concepts and models in policy transfer is contained.
- To apply this analytical model to four real-life case studies in which actual policy transfer from one country to another takes place, two of which are to be studied with an objective outsider angle and two in which the analysts observe as participants to gain an insider's perspective.
- To draw lessons from the four empirical studies and devise a simplified model, which can be made suitable for a social gaming-simulation (computer-supported role-play).
- To play a game in which cross-national policy transfer is simulated with real participants performing the role of policy actors are placed in four different institutional contexts. In this fashion, the differential impact of different institutional frameworks on the processes of transmission and mutation can be observed and verified.
- To test whether several runs of the same gaming-simulation for all different institutional frameworks lead to the same results and see how robust the conclusions on the interplay between evolutionary mechanisms and institutional adaptation are.
- To integrate the theoretical and empirical findings of this work-package into the overall project framework.

### Description of work

International organisations and Communities of Practice pay a growing amount of attention to global 'best practices', these being international benchmarks for way in which policy problems are best solved or for the most effective or efficient institutional systems in a given policy area. What is often overlooked is that these best practices have been taken from a particular national, political and institutional environment and cannot be so easily copied from the one national environment to the other. If these promising concepts and models are to be made effective and operational at all, they have to be contextualised to fit their new institutional environment. Here the evolutionary thinking as it was developed by evolutionary philosophers and psychologists (Toulmin, Hull, Plotkin, Dennett, Campbell) and the factors/criteria that determine the attractiveness of concepts as developed by **Heylighen** prove extremely useful. It is through an understanding of the evolutionary principles and mechanisms of conceptual replication and mutation and the interplay between social interaction and cultural transmission that useful knowledge on the dos and don'ts of cross-national policy transfer can be generated.

**Description of work (continued)**

In the first six months of the project, state-of-the-art knowledge on evolutionary theory applied to the organisational, policy and administrative sciences is inventoried and an analytical model is produced. This should cover the basic mechanisms of replication and interaction as they work in environments where policy actors operate in institutional contexts and where these actors may be affected by the attraction of concepts, but in differential ways because of differences in actor goals and actor behaviour and different institutional rules.

In the months 7-19, four case studies on cross-national policy transfer will be conducted, two of which are done from an outsider perspective to view things objectively and from a distance and two as participant observers to gain valuable insider information. These case studies should teach us how the principles and mechanisms underlying cultural transmission and mutation in policy transfer operate and what their consequences are.

In the months 20-36, first the analytical model from the first six months will be refined based on the insights gained from the case study, after which a gaming-simulation will be developed. In this simulation, where real participants perform the roles of policy actors confronted with a realistic policy transfer event, it will be tested how different institutional environments affect the replication and mutation process in different ways. These institutional environments will be based on the basics of divergent national models in Europe, such as for instance features of the Nordic, Anglo-Saxon, Germanic and Latin institutional models. This serves as the third verification phase in the work-package. In order to reach robust conclusions, it is vital that all different institutional environments are run several times. Finally, the analytical model is adjusted for the last time and should be able to provide clear success and failure factors for policy transplantation based on the evolutionary framework.

The specific time schedule of the work package is the following one:

Project Month 1-6: phase 1: theoretical inventory and analytical working model

Project Month 7-19: phase 2: conducting the four case studies

Project Month 20 – 36: Developing and playing the gaming-simulations and drawing conclusions on the dos and don'ts of policy transplantation.

**Deliverables**

D4.1 - Month 6: Theoretical survey and an analytical working model on the principles and mechanisms of cultural transmission in the world of public policy

D4.2 - Month 18: Report with four case studies on policy transfer and a thorough analysis of how the cultural transmission and mutation intersected with actor behaviour and interaction and what the results were in terms of (un)successful policy transfer

D4.3 - Month 27: Social simulation model suitable to test how policy transfer operates in four different national institutional environments and ready to use to gain predictive insight as to the viability and chances for them to exert a successful policy transfer.

D4.4 - Month 36: Report on (1) the outcomes of the various runs of the gaming-simulation and an analysis of the differential results of those runs, including statistics based on computer measurements of the frequency concepts are used other quantitative and qualitative outcomes, and (2) conclusions on the dos and don'ts of policy transfer, based on evolutionary theory.

**Milestones and expected result**

Milestones:

M4.1 - Month 6 when the first report will be delivered

M4.2 - Month 18 when the second report will be delivered

M4.3 - Month 27 when the gaming-simulation will be delivered

M4.4 - Month 36 when the final report will be delivered

Expected Results:

The expected result is a comprehensive knowledge base of how evolutionary mechanisms impact the adoption and mutation of concepts in different institutional settings and on how policy makers can contextualise international best practices to their own setting. The result will also be a gaming-simulation model allowing *mutatis mutandis* policy makers to test for their own cases at hand how the policy transplants (concept, model) they desire will land and be processed in their own institutional setting.

## WP5 An epidemiological study of cultural dynamics in the ‘wild’

<b>Workpackage number</b>	5	<b>Start date or starting event:</b>				Project Month 1
<b>Participant id</b>	VUB	UoN	TUD	LHSTM	LSE	
<b>Person-months per participant:</b>	6	0	2	36	2	
<b>Objectives</b>						
<p>The overall objective is to study how people in ‘naturalistic’ circumstances acquire and then transmit cultural information. The specific aims are:</p> <ul style="list-style-type: none"> <li>• To determine whether the characteristics of memes more successfully transmitted in a natural setting are those postulated by <b>Heylighen</b> (1997, 1998).</li> <li>• To link the diffusion of beliefs to behaviour, making it possible to investigate the roles of both word-of-mouth or media (explicit transmission) and imitation from behaviour modeling (implicit transmission) as modes of information diffusion.</li> <li>• To discriminate between the pattern of transmission by people who acquire information in a face-to-face context from those who learn of an innovation through the media.</li> <li>• To increase the ecological validity of studies undertaken as lab-based or computer-simulated experiments.</li> <li>• To have an appreciable impact on how future public health interventions are implemented, as results will inform how to best achieve behaviour change on the large scale.</li> </ul>						

### Description of work

As part of the International Partnership for Handwashing, the Hygiene Centre at the London School of Hygiene and Tropical Medicine is undertaking a number of national programmes to spread a particular message: the utility of washing hands with soap to prevent transmissible diseases. The proposed study will piggy-back on one of these intervention programmes in India to track the diffusion of information over time through a single population. Two forms of intervention are planned: either a traveling ‘road show’ or media campaign. The road-show involves a professional agency moving from community to community implementing a combination exhibition/demonstration of hand-washing with soap. Alternatively, communities in some areas will be subject to mass media campaigns (radio or television advertisements) designed to promote hand-washing.

The study population will be divided into four different ‘treatment’ conditions: 1) ‘no intervention districts’: the control condition in areas where there is exposure to neither road-shows nor media; 2) ‘road-show only’ districts can be investigated for diffusion based strictly on direct contact, followed by word-of-mouth through social networks; 3) ‘media only’ districts in which exposure to media (e.g., public service radio spots), will be studied for both word-of-mouth and media-based diffusion; 4) ‘media plus road-show’ districts, where the (potentially synergistic) interaction of the two forms of direct contact (road-show) and indirect contact (media) can be investigated.

To determine the pattern of inter-personal transmission, the networks in which information about the handwashing innovation are disseminated will be sampled by tracing actual transmission chains from person to person over time for a random sample of target individuals (who serve as initiators of transmission chains).

Data collection protocols (e.g. sampling methods) and materials (e.g., questionnaires) have already been trialed and found to be successful in eliciting reliable information during a previous project by the proposers for a major multi-national corporation, which traced the diffusion of information through social networks in a major Indian city after the introduction of a new media campaign and a new product.

In the first six months, baseline data on knowledge of, and attitudes toward, hand-washing with soap will be collected in all four treatment areas, prior to any intervention, and psychological questionnaires will be designed following small-scale testing of question formats. In months 7-12, the road-show interventions will take place in Treatment 2 areas, with media materials designed based on experience of effectiveness of road-show materials. In months 24-30, media campaigns will be implemented in Treatment 3 and 4 areas, and the diffusion of handwashing practice and knowledge will be tracked through transmission chains in Treatment 1 and 2 areas. In months 31-48, the diffusion of information will be tracked as well as random population samples for changes in the overall level of awareness of handwashing and its health function in all 4 Treatment areas.

**Deliverables**

D5.1 - Month 6: Baseline levels of hand-washing awareness and practice in all areas prior to intervention.

D5.2 - Month 12: Report on number, date and location of road-shows conducted and reports on intervention methods and materials used.

D5.3 - Month 24: Media spots and 6-month reports on handwashing diffusion through Treatment areas 1 and 2.

D5.4 - Month 36: Final report on the outcomes of the various interventions

**Milestones and expected results**

M5.1 - Month 6: the report on baseline levels of knowledge and practice of hand-washing will be delivered

M5.2 - Month 12: the road-show report will be delivered

M5.3 - Month 24: the media materials and first six months of knowledge and practice diffusion data will be delivered

M5.4 - Month 36: the final report will be delivered

Expected Results:

- Better knowledge of how social networks structure the transmission of knowledge and behavioural practices associated with that knowledge
- An ability to predict which kinds of people are more likely to adopt new health practices
- A model of the most likely long-term progress of diffusion of a new habitual behaviour through extrapolation of the trend seen during the study period
- Policy implications for public health policy in terms of implementation of large-scale intervention strategies for best achieving behaviour change in habitual behaviours

## WP6 Assessing word of mouth effects

<b>Workpackage number</b>	6	<b>Start date or starting event:</b>				Project Month 1
<b>Participant id</b>		VUB	UoN	TUD	LHSTM	LSE
<b>Person-months per participant:</b>		2	0	2	0	12

### Objectives

to assess in how far word of mouth around EU universities predicts university performance

### Description of work

Word of mouth recommendation levels are fast establishing themselves as a key metric in cultural dynamics in the commercial world. The higher the recommendation rate, the higher the future sales growth for a product or service. This word of mouth recommendation rate among adopters of a particular product has been found to be a better predictor of future performance than 'satisfaction' or any other user perception.

To assess whether word of mouth recommendation rates for EU universities predict university performance (measured in terms of applications received from prospective students and results obtained by existing students), this work stream will conduct an email survey among students of the top 100 EU universities in Belgium, the Netherlands, and the UK. This survey would seek to elicit at least 5,000 respondents. Respondents will simply be asked how likely on a 0-10 Likert scale it is that they would recommend their current university to a friend.

By subtracting the percentage of respondents who answer neutrally or negatively (word of mouth "detractors" who score 0-6) from the percentage who score positively (word of mouth "promoters" who score 9-10), we get what is known as the "Net Promoter Score". It is this Net Promoter Score that has been found to correlate with future changes in performance in the commercial world (Marsden et al. 2005). The survey would allow us to calculate the 2006 Net Promoter Scores for each university. We would then collect application data and exam data for 2004, 2005, 2006 and 2007 for each of the universities. This would allow us to test for a link between the NPS (net promoter score) and annual changes in performance (past, present and future).

Overall this work stream can be split into the following phases

Phase 1 (Project Month 1-6): Internet survey to establish Net Promoter Scores for EU universities in UK, Belgium and the Netherlands

Phase 2 (Project Month 7-12): Performance data collection (application levels and pass rates for each university)

Phase 3 (Project Month 13-15): Analysis of data, testing for a link between NPS and performance

Phase 4 (Project Month 15-18): Report writing, implications for memetic theory and recommendations for policy

### Deliverables

D6.1 - Month 6: Net Promoter Scores for Universities.

D6.2 - Month 12: Performance data (application levels and pass rates for each university).

D6.3 - Month 18: Final Report

### Milestones and expected result

M6.1 - Month 6: Net Promoter Scores for Universities made publicly available

M6.2 - Month 12: Performance data for universities made publicly available

M6.3 - Month 18: Final Report made available

Expected Results:

We expect the NPS, as a measure of the recommendability of a university among current students, to predict university performance in the academic year 2006-2007 in terms of application levels and pass rates

## WP7 Management

<b>Workpackage number</b>	7	<b>Start date or starting event:</b>				Project Month 1
<b>Participant id</b>	VUB	UoN	TUD	LHSTM	LSE	
<b>Person-months per participant:</b>	18	1	1	1	1	

### Objectives

To coordinate the activities of the work packages  
 To convene and chair the Project Steering Committee (PSC) meetings  
 To manage the project's finances, interfacing each workpackage to the EC  
 To report to the EC, according to its regulations

### Description of work

Project management is described in Section B.5. Project coordination will be achieved through regular meetings, email discussions and the use of a web-based workflow environment, listing all collected data, results and outstanding questions to data. All partners are required to attend regular project meetings for which they have specific resources allocated. Frequent teleconference meetings are scheduled in order to assess any risks that are possible to emerge during the implementation of the project.

The activities of this WP include: control of activities of the project, coordination of the partners and their activities, control and delivery of documentation, compilation and submission of deliverables, administration of the project, paperwork, update of financial statements, control and activation of payments, compilation and requirements for presentations.

### Deliverables

D7.1 Web-based project management tool  
 D7.2 Overall Project Report and financial statement to the EC

### Milestones and expected result

M7.1 (Month 0) PSC Kick-off meeting,  
 M7.2 (Month 12) PSC meeting to check progress and discuss further strategy  
 M7.3 (Month 24) PSC meeting  
 M7.4 (Month 36) Dissemination of overall report on the project

## **B.7 Other issues**

### **B.7.1. Ethical issues**

There are no particular ethical issues involved in this project in that we are working only with publically available data, or data gathered from observing the behavior of volunteer participants in cultural transmission experiments or business games. No personal data will be collected about the participants, and all results will be anonymized. The volunteers will be duly informed about the practical aspects and general intent of the experiments in which we invite them to participate (without of course stating the *specific* hypotheses we are testing, so that as not to bias the participants' reactions).

### **B.7.2 Gender issues**

Given that the majority of people in the participating teams are male, when employing additional researchers to carry out the project, we will where possible choose women, according to the philosophy that of two equally qualified candidates, the female one gets the preference.

As to our observations and experiments, if we obtain enough data about women, respectively men, to determine statistically significant trends, we will try to determine whether there are gender differences in the phenomena we investigate. For example, it may turn out that women communicate in a way different from men so that certain types of memes are transmitted more easily in the one population than in the other.

## Ethical issues checklist

**Table A. Proposers are requested to fill in the following table**

Does your proposed research raise sensitive ethical questions related to:	YES	NO
Human beings		X
Human biological samples		X
Personal data (whether identified by name or not)		X
Genetic information		X
Animals		X

*If you answer “YES” to any of the above, please include in your proposal section B7.1 the more detailed version of Table A (“Crucial information”) obtained from:*

*[http://europa.eu.int/comm/research/science-society/ethics/rules\\_en.html](http://europa.eu.int/comm/research/science-society/ethics/rules_en.html)*

*and also incorporate in section B.7.1 and in other appropriate parts of your proposal comments corresponding to the detailed instructions given in sections C-D at the above address*

**Table B. Proposers are requested to confirm that the proposed research does not involve:**

- Research activity aimed at human cloning for reproductive purposes,
- Research activity intended to modify the genetic heritage of human beings which could make such changes heritable<sup>12</sup>
- Research activity intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

Confirmation : the proposed research involves none of the issues listed in Table B	YES	NO
	X	

<sup>12</sup> Research relating to cancer treatment of the gonads can be financed

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