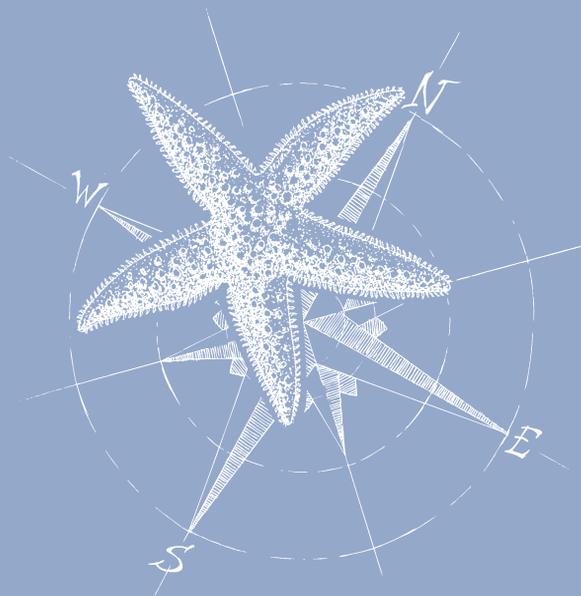


# The Potential Uses for Video games in enhancing Governance of Marine Resources



F. Briand, L. Giuliano

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## The general context

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In European and Mediterranean waters- and in most of the world ocean as well- marine policies have clearly failed to regulate overfishing and to sustainably manage multispecies fisheries despite the best available scientific and economic expertise. To compound the problem, if fishery scientists know how to communicate to other scientists, they are not very good, on average, at communicating to the public at large and in influencing policy-makers.

To explore ways to possibly break this pattern, CIESM gathered a mix of marine scientists and fisheries economists from various horizons, together with game developers having experience in natural resources gaming, to freely exchange views over the course of one day in March 2011 in Göteborg, Sweden.

This article, written by the moderators and peer-reviewed by the expert group (see profiles in Annex 1), analyses the most promising potential of various video game genres in informing / educating - in a light, entertaining fashion - a large public about the complex challenges facing a fisheries sector globally threatened by declining stocks and dysfunctional governance. It further examines the possibility to directly influence policy makers by realistic visualizations of science-based, alternative scenarios for regional/global marine fisheries.

Particular attention is given to the diverse target audience(s), to the pros and cons of various gaming approaches in this respect, to the lessons previously gained from both successes and failures. The main points, conclusions and recommendations are presented below, following brief definitions of essential technical terms used throughout.



**Box 1.** *A brief history of computer video games*

The birth of the modern video game is usually given precisely as 29 November 1972, when the game *Pong* was launched in Sunnyvale, California, although this claim can be made for the (less known) Odyssey console of Magnavox. Between 1971 and 1976, “first generation” video game consoles, based on dedicated logic circuits without any microprocessors, started to be distributed. Next appeared flexible video game consoles (also called VCS - for Video Computer System), which allowed users to play different games by means of interchangeable cartridges. The second generation of video game consoles came to an end with “the North America video game crash of 1983”, linked to market saturation by low quality consoles, which saw the disappearance of a number of companies. In the late 1980s, personal computers became available, with dedicated video games. Customised chips for graphics and music, that constituted the last advantage of arcades, were finally overtaken in the ‘90s by marked improvement in PC-related technologies and by low cost microelectronics for consoles. The availability of high quality graphics and of increasing computing power at lower costs<sup>1</sup> allowed the production of many new genres of games.

In the late ‘80s/ early ‘90s videogames became routinely used in the classroom for early teaching (map, early reading, etc.) During the last 30 years, computer videogame technology has been largely used for additional, mostly recreational activities (hear music, play movies, etc.) There is a broader and broader audience beyond various other video games’ applications (framework for collaboration, communication, prioritizing ...): the potential is vast. The fast emerging sector of ‘Serious Games’, which creates tools allowing people to explore choice and consequences, to play with complex variables, to simulate real-world processes, to create a highly motivated way of learning (P. Smith, 2004)<sup>2</sup>, is particularly notable.

<sup>1</sup> G. De Prato, C. Feijóo, D. Nepelski, M. Bogdanowicz, J.P. Simon (2010) BORN DIGITAL / GROWN DIGITAL: Assessing the Future Competitiveness of the EU Video Games Software Industry. JRC Scientific and technical report. <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=3759>  
<sup>2</sup> Peter Smith (SGS DC 2006): Games in Education Video - interviews with keynote speakers Jim Gee, Clark Aldrich, and Henry Jenkins (<http://www.seriousgames.org/>)

## A few definitions<sup>3</sup>

Video game genres categorize video games on the basis of their game play interaction rather than visual or narrative differences. Among the main categories:

**Action games** require players to use quick reflexes, accuracy and timing. Such games include shooter games and adventure games and require the player to solve various puzzles/ challenges by interacting with people or with the environment.

**Role-playing games** involve complexity, with developed narrative elements and developed player character. Most cast the player in the role of one or more actors with a specialized set of skills who then progresses through a pre-determined story line.

**Simulation games** are designed to closely simulate aspects of a real or fictional reality. They include a diverse array : in construction games, the players build and manage fictional communities , cities, or projects with limited resources; in political games they simulate the policies and government of a country while excluding warfare; life simulation games involve controlling one or more artificial lives and can revolve around individuals or could simulate an ecosystem.

## Visual demonstrations

Distinct types of games and visuals, centered for the most part on fishery exploitation and future fishery scenarios, were analysed during the discussions.

### EcoOcean developed at Kiel University, Germany

This action game<sup>4</sup>, recently developed within the 'Future Ocean' cluster of excellence at Kiel University for a special museum exhibition in Munich, was presented by Jörn Schmidt and Dennis Nissen. Involving up to four players who are free to exploit different marine zones at their own (fast or slow) pace, it rewards the player who will score high on both fishery stock sustainability and catches. The underlying idea - to develop an appealing device to illustrate the basic problem of fisheries to the public - appears to work: demonstrated in a few representative arenas, this game has raised the interest of both scientists and fishermen, and received a special award for the most original contribution to the ICES ASC 2010.

<sup>3</sup> Adapted from Wikipedia

<sup>4</sup> <http://www.ecoocean.de/the-game/>



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The EcoOcean developers' team is now considering the preparation of a more elaborate version (*EcoOcean+*) that would add complexity and realism by integrating options such as harbors, different water depths, distinct fish biology variables, different fish stocks, different management measures, different market values and catch-dependent pricing.

### Simulations and role-play games developed by Media Farm, Stavanger, Norway

Various games developed in recent years by Media Farm on 'societal' issues ranging from '*Intelligent Energy*', '*The Norway Quiz*', to the new '*European Parliament*' role-play game, were introduced by Vilhelm Skjærpe. Aiming to reach the young public as well as policy makers, his company adopted a strategy that proved successful by installing its game stations in various national and regional Museums (Norwegian Oil Museum, Norwegian Science Museum, Gargorg Centre, etc), in two major newspapers and at the Confederation of Norwegian Enterprises. A number of these games are interactive, timeline-based role-plays which mix participants with computer-controlled virtual actors.

### Strategic games / visuals developed at UBC Fisheries Centre

A number of visuals, from animated documentaries on the Chesapeake Bay<sup>5</sup> ecosystem history and future to highly sophisticated visualizations of test summits allowing role players to engage in alternative fishery scenarios, were presented by Villy Christensen.

By adapting Blender, an open source 3D gaming engine, to the EcoSim (EwE) software and the global FishBase and EcoPath datasets, Dr Christensen and his team at the University of British Columbia have powerfully translated the high complexity of managing dynamic multi-species marine resources into beautiful, easy-to-understand visuals that display various futures<sup>6</sup>. These high-level investment products, for used in a series of 'Ocean Summits'<sup>7</sup>, are geared to policy makers who can intuitively program different variables (on culling levels, market prices, intensity of fishing effort, gear complexity, fuel prices, etc) and quickly visualize the outcome on fish stocks through future decades.

Convinced that interactive video games backed by the best available science have great potential for fishery management, the University of British Columbia Fisheries Centre has engaged ambitious long-term cooperations with various

5 [http://www.youtube.com/watch?v=\\_H0nrhM2Icw](http://www.youtube.com/watch?v=_H0nrhM2Icw)

6 <http://www.youtube.com/watch?v=owlKQJbfDopU>

7 [www.lenfestoceanfutures.org](http://www.lenfestoceanfutures.org)

Foundations (Nippon, Pew, Lenfest) and with the Center for Digital Media in Vancouver to provide innovative computer-based tools aimed at raising awareness among fisheries stakeholders. Among these, documentaries on the role of shark in the ecosystem are in the making as well as gaming approaches involving the public at aquariums.

## Key points of the discussions

### Target audience

Various categories of video games do reach very distinct audiences. Fast action games, favouring quick, numerous rewards and instantaneous feedback appeal to the younger crowd. But even these do not exclude the possibility of real social value: as pointed out in our discussions, even fairly basic Facebook game applications, if well thought out, can deliver valuable educational content. Two examples relevant to our context are social 'eco-friendly' games that are geared to reach the 300 million users of Facebook: '*Oceanopolis*', which engages the players to keep their island and surrounding ocean waters waste-free; and '*Ecotopia*', just released with the support of Conservation International, where you can change a decrepit world into a sustainable paradise by careful application of 'green actions'. It is notable that both games reward players with points for green actions in the real world.

Serious games can serve different purposes: for example, to transfer knowledge to children as in '*A new beginning*', or as a tool for stakeholder communication as in '*REEFGAME*' which explores the dynamics of subsistence fishing communities. Simplification enhances the desired objective in some cases, but not in others, as described in a recent study<sup>8</sup> that classifies possible game styles according to learning content and activities.

While 'core gamers' are still found in the 18-35 age group, the games market is fast diversifying. The 2009 Nielsen Report<sup>9</sup>, which breaks down computer players by age and gender, revealed surprising features: the age group among male players has expanded significantly up into the 25-40 age group; and women in the 25-54 year old group now make up the largest percentage of computer video game players. For casual online puzzle-style and simple

8 RapeepisarnK, Wong KW, Fung CC, Khine MS (2008) The Relationship between Game Genres, Learning Techniques and Learning Styles in Educational Computer Games. In Z. Pan et al. (Eds.): Edutainment 2008, LNCS 5093, pp. 497-508, 2008.

9 Nielsen 'State of the Video Gamer' Report

[http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/04/stateofgamer\\_040609\\_fnll.pdf](http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/04/stateofgamer_040609_fnll.pdf)



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mobile cell phone games, the gender divide is more or less equal between males and females. Women have also been found to show an attraction to online multi-player games where there is a communal experience. More recently a growing segment of female players engaged in the aggressive style of games historically considered to fall within traditionally male genres. According to the ESRB over 40% of American PC gamers are women<sup>10</sup>. Further, the enormous development of simple-graphic game applications for smart phones, and the growing popularity of well-designed mass multi-player online games demonstrate the growing appetite of millions of players<sup>11</sup> – among them an increasing fraction of high-professional women – for game genres providing both entertainment and social values.

An optimal communication strategy, aiming to bring the complexity of marine living resources to the widest audience, will need to rely on a diverse, heterogeneous toolbox. With different, complementary video game genres, from fast action and instantaneous feedback (one-shooter) games to sophisticated simulations for complex multi-player role plays. One may also develop different versions from the same simulation concept for different purposes. In all cases prioritizing the target groups will be essential. This includes schools where games can be successful provided that the plot/content/theme are relevant to their curriculum.

### Emerging features - education and cooperation

*Education* - While visuals have long been used in educational settings to great effect<sup>12</sup>, the initial perception of interactive videogames by professional educators was not exactly favorable. Perceptions have changed and it is now broadly recognized that good digital games not only enhance creativity and communication skills, but also learning<sup>13</sup>. School and college administrators, at least in North America, have been quick to get the message and a number of universities have developed remarkable interactive ‘educational’ video games as a result, often with the support of the National Science Foundation (see Box 2).

10 Guy, Hannah (2007). “Women video gamers: Not just solitaire”. *PC World Canada*. <http://www.asiancanadian.net/2007/03/women-video-gamers-not-just-solitaire.html>.

11 Over 3 billion hours/week are already devoted to playing video games, according to Jane McGonigal.

12 For example, the current ‘*Story of Stuff*’ and ‘*RSA Animate*’ series, accessible on youtube.com, translate complex issues (story of electronics; geography of time; etc.) via simple, brief, yet powerful animated stories.

13 Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave/Macmillan. (2004). *Situated language and learning: A critique of traditional schooling*. London: Routledge. (2007). *Good videogames and good learning: Collected essays on video games, learning, and literacy*. New York: Lang.



**Box 2.** *The Top 10 Free Educational Video Games*

This list<sup>14</sup>, produced in 2007 by Educational Games Research, ranked games on the basis of their impact on the educational gaming sector. The criteria for consideration were simple: the game must be free and available online.

Among the top ten:

- '*Quest Atlantis*'<sup>15</sup>, a multi-user virtual environment created by Indiana University with NSF support, to help students understand environmental concerns, scientific standards, social studies and current events;
- the UN-backed '*Food Force*'<sup>16</sup> now available in a dozen languages, to understand world hunger and efforts to alleviate it;
- and the world-famous '*SimCity*' series<sup>17</sup> that challenges you to build and sustain cities and societies of increasing complexity.

Many new video games have been developed or improved since the introduction of this list: '*Selene*'<sup>18</sup>, created by Wheeling Jesuit University with funding by NASA and NSF to introduce science concepts along with lunar exploration, is only one example. '*Evoke*'<sup>19</sup>, a ten-week crash course to change the world, developed by the World Bank Institute, is another.

A successful educational game is one that will provide entertainment together with high learning content. Not only to students, but to teachers and adults alike. A player having to make day-to-day decisions of managing a city, as in '*SimCity*', or running a country as in '*Democracy*', will obviously develop better strategic thinking and planning skills in the process. Even arid subjects can be entertaining: the latest wave of 'serious' games includes simulation and gaming tools to prevent global climate chaos, like '*Fate of the World*' or '*A new Beginning*'.

Cooperation - Gaming supports that allow continuous game play from one device to the next, offering a trans-media gaming experience through the use of an Internet connection, are now multiplying. This in turn favours the popularity of online cooperative play demonstrated by various video game

<sup>14</sup> From „Educational Games Research - Research and discussion concerning instructional video games' (<http://edugamesresearch.com>)

<sup>15</sup> <http://atlantis.crlt.indiana.edu>

<sup>16</sup> <http://www.food-force.com/>

<sup>17</sup> see introduction to the SimCities universe in <http://simcitysocieties.ea.com/videos.php>

<sup>18</sup> <http://selene.cet.edu/>

<sup>19</sup> <http://www.urgentevoke.com/page/how-to-play>

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genres (in particular via social networks channels), allowing the player to form a team and gain advantage in obtaining further resources or in researching questions. Such behaviours, combined with games that reward cooperative mechanisms and the maintenance of a high diversity of players (and of fish species) could help relay the powerful concept that long term cooperation among stakeholders competing for a common pool of resources (in this case, marine fisheries) is in the end preferable to frontal competition.

The real-life example of the Wadden Sea ecosystem in Europe, successfully co-managed<sup>20</sup> by three countries (Denmark, Germany, the Netherlands) with due consideration of the respective interests of fisheries, marine conservation, and the oil and gas exploration industry was cited as a potential background for a video game illustrating the rewards of cooperative mechanisms.

### The underlying video market

Although the success of gaming is tangible (it has attracted a vast audience), uncertainties remain about the underlying business models and the ability to bring satisfactory returns on the investment. A recent analysis of the videogames software industry in the EU (De Prato et al., 2010)<sup>21</sup> indicates that most of the expected growth will come from on-line and mobile games. Their deployment will no doubt reach out to other connected platforms.

Serious games often cannot match the sophistication of today's commercial games because they do not have nearly as much money for development as commercial game designers. But the failure may also be one of imagination. After all, young gamers make computer games for next to no money, some of which have gone on to large commercial success and put many serious games to shame. Further, empirical results do suggest that the ultimate outcome in a competitive market with network effects is more complex than thought, and that the firm with the largest installed customer base will not always be necessarily the winner<sup>22</sup>.

The environmental games/ visuals presented by the participating developers at this CIESM Workshop did require very different scales of funding : from 25,000 Euros for version 1 of 'EcoOcean' (Jörn Schmidt and Dennis Nissen), to twice as much for a prototype of the 'Big Skipper' game (Villy Christensen), and to millions of dollars for the sophisticated 3-D simulations supporting the *Ocean Summits* developed by the UBC Fisheries Centre.

20 The Wadden Sea Trilateral Commission oversees the sustainable management and protection of the resources encompassed by this large, 80,000 Km<sup>2</sup> wide, trans-frontier marine coastal area. See [www.waddensea-secretariat.org/trilat/structure/CWSS.html](http://www.waddensea-secretariat.org/trilat/structure/CWSS.html)

21 G. De Prato, C. Feijóo, D. Nepelski, M. Bogdanowicz, J.P. Simon (2010). Assessing the future competitiveness of the EU Video Games software industry. A EU/ JRC Report.

22 Shankar V. & Bayus B.L. (2002). *Network Effects and Competition: An Empirical Analysis of the Home Video Game Industry*. Social Science Electronic Publishing, Inc. (doi:10.2139/ssrn.296534)

It is worth noting that the EU-Directorate General for Energy and Transport recently financed the development of 'serious' video games promoting energy efficiency and renewable energy sources, such as *'Intelligent Energy'* (developed by Media Farm with a budget of approx. 60,000 Euros) or *'EnerCities'* (Paladin Studios – [www.energycities.eu](http://www.energycities.eu)) - the latter to the tune of some 300,000 Euros.

### **Concluding remarks about playing**

In general, widely successful games have universal themes/plots. They always have rewards (score-boards, networking people, achieving tasks, reaching new levels, etc.) and they provide updates/ or new releases, often based on research on user preferences.

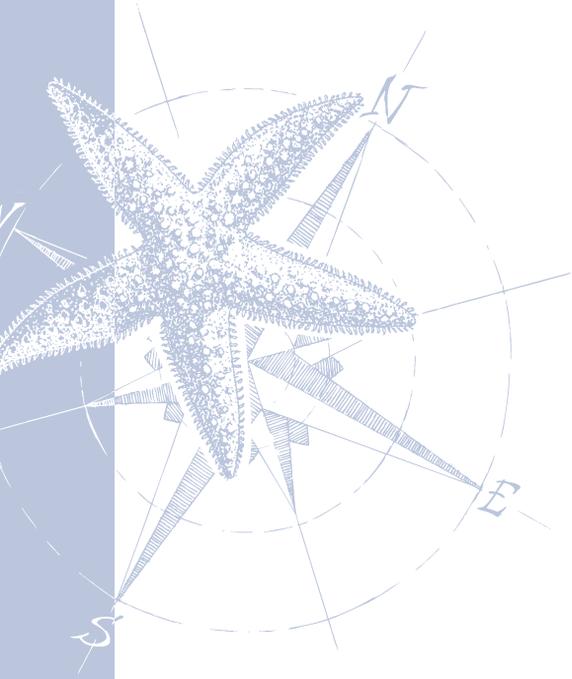
The general audience will play anything if the game has enough entertainment value, either as a one-player or a multiplayer game. As indicated earlier, the current trend though seems to head towards multiplayer and 'social' gaming.

Except from the really dedicated gamers, most people play to have fun, to relax, to socialise – or just to beat the score of their friend.

Important components for successful gameplay include:

- Easy to play, clear task;
- Addictive gameplay;
- A story;
- Good guys and bad guys;
- Works for repeated playing (achieving more, exploring more);
- Scoring/ rewards;
- New levels/ added challenges;
- Fascination (via graphic quality, humour, drama, the unexpected, thrill, beauty, etc.)





## Key recommendations

The promotion of sustainable maritime practices is clearly not less important for the future of Europe than a sound energy base. In view of the broad, increasing appeal of video games to large sectors of the population, European and National Agencies would do well therefore to consider

1. investing in video game development to raise broad awareness about the fragility of ocean resources (particularly fish stocks), the needed consolidation of sea food security, and a wiser marine governance;
2. supporting the adaptation and upgrading of the powerful Ocean Summits software to the European / Mediterranean context, so as to train and influence fisheries managers and high level officials in all relevant countries;
3. facilitate cooperative projects between the videogame technical development sector and marine scientists, including simulation games where the latter would intervene directly on film with the narrative or storyline to add depth, realism and plausibility.

More specifically, the participants expressed much interest in suggestions to develop

- simulation games that would allow the player to interact with the fate of a given fish school across various obstacles : biological (predators), environmental (pollution, degraded habitats), industrial fishing of various intensity, etc.;
- interactive games where the player would have to sustainably manage the marine resources of a well-defined marine region (a sector of the west Atlantic, or of the Mediterranean Sea) with increasing degrees of complexity.

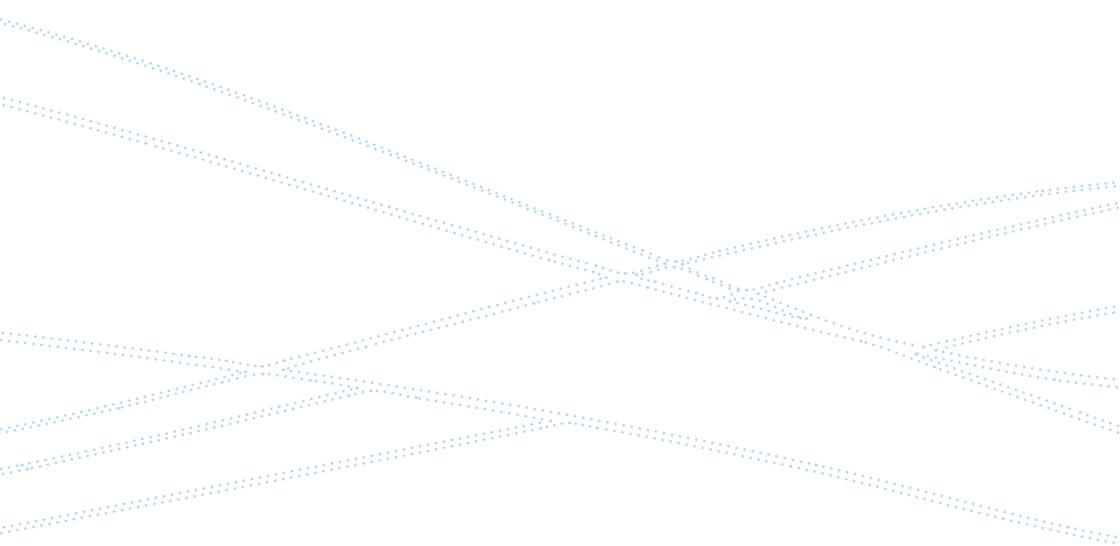
## Digging further

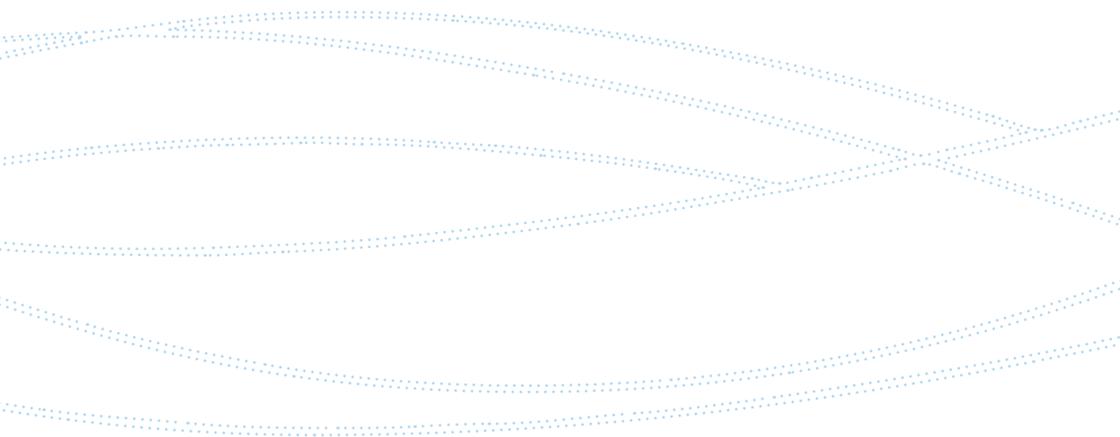
- solid documentation on videogames and learning:  
<http://www.jamespaulgee.com/publications>
- a 20 min conference on 'Gaming can make a better world' by Jane McGonigal (2010):  
[http://www.ted.com/talks/lang/eng/jane\\_mcgonigal\\_gaming\\_can\\_make\\_a\\_better\\_world.html](http://www.ted.com/talks/lang/eng/jane_mcgonigal_gaming_can_make_a_better_world.html)

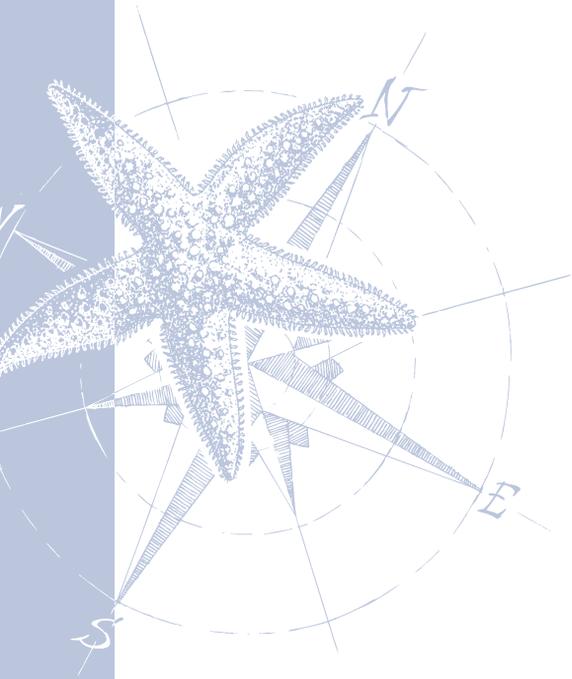


### Aknowledgements

We are grateful to Vilhelm **Skjaerpe** (Media Farm, Stavanger, Norway), Jörn Oliver **Schmidt** (Univ. of Kiel, Germany), Jens **Thorsen** (Funkis Multimedia, Göteborg, Sweden) for thoughtful comments that helped us consolidate the text of this report, and to Villy **Christensen** (Univ. of British Columbia, Vancouver, Canada) and Mike **Gibson** (National Geographic Games Group, Washington D.C., USA) for some precious references.







## Annex 1 - Participants' profiles

### **Mustapha Aksissou**

Dpt of Biology, Univ. of Tetouan, Morocco

Mustapha Aksissou has been doing research at the Dpt of Biology, University Abdelmalek Essaadi of Tetouan (Maroc) since 1991. His first projects were on the biodemographics and dynamics of crustacean populations along the Mediterranean coast of Morocco.

In 2003, he joined the International IUCN-Marine Turtle Specialist Group. With interests focused on sea turtle ecology and conservation, he collaborates with NOAA sea turtle project in Morocco. His projects and research address a wide variety of issues ranging from the impact of fisheries on sea turtle populations, feeding ecology and strandings. He supervises Master and Ph. D. students on sea turtle and fisheries related topics in Tetouan University.

Dr Aksissou organises since 2005 training workshops for fishermen in different Atlantic and Mediterranean Moroccan ports (Tanger, Casablanca, Agadir, Laâyoune). Through these workshops he tries to educate the fishermen about turtles and data collection techniques and also further strengthen his collaboration with them to collect data on accidentally captured sea turtles.

### **Frédéric Briand**

Director General, CIESM

After completing his Ph.D. in marine ecology at the University of California, Irvine, Frederic Briand started his research career in Canadian universities. Conducted various field and theoretical studies on the dynamics of marine coastal ecosystems in north America, central America and the Mediterranean.

Co-discoverer of invariants in the architecture of both marine and terrestrial food webs, he analysed foodchain resilience and stability in different types of habitats, through mesocosm experiments and via cybernetic simulation models.

Thereafter he managed sectors of multi-disciplinary research in International Agencies (Unesco, UICN) before taking the Direction of the Mediterranean Science Commission (CIESM), organization which regroups 22 Member States and 4200 researchers located, for most, around the Mediterranean



Basin and the Black Sea. Frédéric is also a Whaling Commissioner at IWC, a Member of the Advisory Board of various EU-Programs, and represents the Mediterranean region on the UN-InterAgency Committee on the Health of the Oceans (GESAMP).

### **Villy Christensen**

Assoc. Director, Fisheries Centre, UBC, Vancouver, Canada

Dr Villy Christensen got his Ph.D. at the University of Copenhagen and is Professor at the Fisheries Centre, University of British Columbia, Vancouver.

Research of past twenty years centered on understanding how human exploitation impacts marine ecosystems, using ecosystem modeling as the main tool. Played a central role in the development and dissemination of the Ecopath approach and software, through cooperation with scientists worldwide focused on trophic dynamics of aquatic resources. Led a large number of training courses and workshops throughout the world, centered on developing ecosystem approaches to fisheries management. Ecopath modeling has become the de-facto standard for ecosystem approaches to fisheries management, with more than 350 derived models and publications, and more than 6000 registered users in 150 countries.

Current focus is on how to communicate science and how to use science as input to the decision-making process. This involved complete reprogramming of the Ecopath approach, advanced gaming technology (Lenfest Ocean Futures) and visualizations using research on developing and evaluating alternative future scenarios for the world's fisheries (Nereus Program - Nippon Foundation). Developed as a result a system combining Blender, a 3D-gaming engine, with Ecopath, plus animated documentaries (on Chesapeake Bay; on role of shark in the ecosystem). Tested a cooperative gaming approach 'Ocean Summits' through a series of test summits with role players.

### **Dario Ciccone**

System integrator, CESIA, Univ. of Bologna, Italy

Since childhood, Dario Ciccone was a passionate user (and later programmer) of computer videogames. From early 8bit games, to latest advanced 3d simulations, he was always interested in any application of videogames, considering them as an underestimated product, usually relegated to toys market in last decades, but now moving to a wide range of audience, touching

fields as art, science and social interaction.

He graduated in computer science, keeping his passion intact by writing some PC and console freeware games and collaborating with Italian blogs and online magazines about videogaming. He worked with several IT companies, mainly as network programmer, developing medical software and designing virtualization infrastructure clusters. He now works as system administrator and integrator at CeSIA, IT headquarter of University of Bologna, while keeping his videogame programming activity as an independent cell phones and mobile developer. Expert on games architectures and components, as well as on different techniques to build videogames for different hardware platforms.

### **Sam Dupont**

Dpt Marine Ecology, Krisineberg Laboratories, Sweden

Dr Sam Dupont is a marine biologist, trained as an eco-physiologist with considerable experience in echinoderms both at physiological and ecological levels. After a PhD in 2002 at the University of Louvain (Belgium) on evolutionary processes in the sea, he worked as a post-doc for the Swedish Academy of Sciences on different aspects of regeneration and stem cell biology using echinoderm as models. He is currently coordinator of the Ocean Acidification Infrastructure Facility – Kristineberg.

For the last 4 years, Sam Dupont has been working within the Marine Ecology Department at the Sven Lovén Center for Marine Sciences (University of Gothenburg, Kristineberg); his research focuses on the impact of climate change (both global warming and ocean acidification) and other anthropogenic stressors (e.g. pollution) on marine ecosystems.

Sam is involved in different outreach and educational projects which main goals are to bridge gap between general audience, schools and research institutes. He is part of an international project developing some inquiry based learning methods through digital tools that are used by students for entertainment and intercultural collaboration (see <http://i2i.stanford.edu/>).

### **Torgeir Edvardsen**

Special Advisor, SINTEF, Trondheim, Norway

Torgeir Edvardsen has more than 20 years of experience as a researcher within



accounting, management control and strategy. He has published extensively applied papers on the seafood industries and for 10 years he was the editor of the journal *økonomiskFiskeriforskning* which he founded. Since joining SINTEF he has held a position as Business Development Director responsible for establishing large multidisciplinary projects. At present in a position as Special Advisor in the International Projects Department he works primarily on promoting national and European research programmes established and on managing large and international projects. Torgeir Edvardsen was one of the founding fathers of the *European Aquaculture Technology and Innovation Platform* and its first Secretary General. At present he is member of the Board of Directors of the platform, the BoDs representative in the Operative Council and the coordinator for the Thematic Areas.

### **Håkan Eggert**

School of Economics, Univ. of Gothenburg, Sweden

Håkan Eggert is Associate Professor in Economics, School of Business, Economics and Law at University of Gothenburg. He has also been developing the Environmental Social Science Program at University of Gothenburg, and is currently Chairman for this undergraduate program.

He earned his Ph.D. in Economics in 2001 with a thesis on problems related to commercial fisheries. The thesis work was part of the research program Sustainable Coastal Zone Management. He has published papers on bioeconomics, risk, production, compliance and valuation, usually with a link to marine resources. The research on fisheries deal with issues like exploitation under different regulatory regimes, on the relation between fisheries and trade, on fisheries co-management, on fishermen behaviour models, with cases from Sweden, the Baltic, Norway, Iceland, and Tanzania. Another strand of his research deals with trade and trade policies in relation to the environment or natural resources. He has also served as an expert advisor to the Swedish Environmental Protection Agency, for the Commission on the Marine Environment appointed by the Swedish Government and the public report *Fishy Fishing: Decision-Making and Economic Performance in Swedish Fishery Policy*, appointed by the Ministry of Finance. He also served as expert advisor to the Report *Fishing 2020* commissioned by the Director of the Swedish Board of Fisheries in 2010.

## Mike Gibson

Producer, National Geographic Games, Washington D.C., USA

Mike Gibson's 20 years in the Video Gaming and Animation industries has included successful turns as Artist, Animator, Designer, Creative Director, and Director of Development with ambitious start-ups, established independent shops, and as part of the world's largest entertainment company.

Mike's gaming career began in 1990 at Microprose Software where he led multiple teams in the on-time delivery of digital art assets for epic adventure games and contributed to the creation of a proprietary adventure game engine. Four years later, Mike was recruited as Art Director by Sanctuary Woods Multimedia (Victoria, BC) to hire and train staff, establish efficient production methodologies, and build 3D modeling and video-capture capabilities. The Walt Disney Company, looking to expand its production capacity, purchased Sanctuary Woods in May 1996. Over the next four years, initially as Manager and ultimately as Director of Creative Resources, Mike instituted art and audio production pipelines that guaranteed delivery dates for a broad range of Disney-branded PC titles, from print studios to learning adventures to arcade classics. In addition, Mike designed several titles in the Disney Learning series.

Returning to Maryland in May 2000, Mike had a chance to work once again with legendary game designer Sid Meier, known in the industry as the "Father of Computer Games. As Director of Development and Creative Resources Director at Firaxis Games, Mike was responsible for establishing the look and feel for instant gaming classics such as *Sid Meier's Pirates!*, *Civilization III*, *SimGolf*, and *Civilization IV*. He doubled the size of the creative staff during his tenure, presided over a successful transition from pre-rendered to real-time 3D, and established standard practices for recruiting, staff evaluations, and staff training.

Mike currently does double duty as founder of Gibson Creative Partners, a consulting shop for companies in need of top-tier interactive services and Producer in the Games group at National Geographic, where he helps bring "games that matter" to a wide casual gaming audience.

## Laura Giuliano

Scientific Advisor, CIESM

Laura Giuliano is scientific Advisor at CIESM. After obtaining her Ph.D. from the University of Marseille on "Distribution and functional characterization of marine bacteria in relation to the hydrological characteristics of the water bodies", she did a post-doc at the National Centre for Biotechnology (GBF, Germany) and then worked at the National Research Council (CNR) in Italy.

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Participated to national (EOCUMM, PNRA, CLUSTER-SAM, PON-SABIE) and international projects (BIODEEP, COMMODE, EUR-OCEANS), often with leading responsibilities. Member of different evaluation panels for selecting research proposals to be funded by both national (CNR-It, MIUR-It, PNEC-Fr) and intergovernmental Commissions (EU FP5, FP6). Besides publishing scientific articles in international journals, she also pays attention to the promotion of science across a larger public TV, press).

Laura's work at CIESM Headquarters focuses on facilitating the harmonisation of major national marine initiatives (from oceanographic cruises to blue biotechnologies) and strengthening relations with EU programmes.

### **Maurice Héral**

Head, Ecosystem and Development, ANR, France

Maurice Héral is now responsible for Ecosystem and Sustainable Development at ANR, the French National Research Agency. Prior to that he was Director of Programmes and Strategy at Ifremer. Maurice specialized in Ecology and Oceanography at the University of Nantes with a master of sciences in 1974 and the Habilitation to Deliver Research in 1984. His main research areas are the study of coastal ecosystems including the exploitation of living resource; ecophysiology and trophic requirements of molluscan shellfish; modelling of carrying capacity for coastal ecosystems, and Integrated Coastal Zone Management. Maurice is credited with several scientific innovations: he was the first to demonstrate that the carrying capacity for cultivated oysters ecosystem is limited and that the exploitation rate is over-reached. He further developed applications of carrying capacity models for different European and American ecosystems for the Japanese oyster. He demonstrated the deleterious impacts of Tributyltin (TBT) used as anti-fouling substances on the oyster growth rate. By using models of trophic webs of molluscan ecosystems he showed the strong interrelationship between the yield of the cultivated stocks and biomass of phytoplankton.

Maurice wrote more than 270 publications in scientific journals and public reports and supervised the realisation of 15 PhD thesis. Coordinator (since 2002) of the EFARO network 'European Fisheries and Aquaculture Research Organisation' and member or chair of many ICES committees he promotes marine research. From 2003 until 2006 he served as elected vice-President of ICES. Coordinated several EU contracts and very active in the ERANET, representing France in four of them.

**Dennis Nissen**

Germany

Dennis Nissen studied computer science at Kiel University and is an independent software developer with balance points at relational databases and rich internet / desktop applications as well as developing economic experiments based on different frameworks and OpenGL graphics / game development.

He is an experienced JAVA/C++/C#/PHP/Ruby developer, with advanced knowledge in relational databases including ORM and EAV as well as in computer network systems, image processing and 2D/3D graphics development with OpenGL. He has developed many eCommerce platforms for b2b and b2c clients with various import/export options to different portals with huge amount of data with automatic data synchronizing between each platform over network and lots of interfaces to other systems, including different enterprise resource planning platforms, written in different languages including PYTHON and PERL.

He has knowledge of administering Linux Systems in wide/local area networks including configuration of all well known server software like apache, tomcat, nginx, mysql, postfix, qmail, subversion, tomcat, jBoss, Glassfish.

**Corrado Piccinetti**

Head, Lab. Marine Biol. & Fisheries, Univ. Bologna, Italy

Corrado Piccinetti, Biologist, is Associate Professor of Ecology at the Faculty of Science of the Bologna University. He has been Responsible for the Marine Biology and Fisheries Laboratory in Fano - University of Bologna, since the year 1977.

Prof. Piccinetti is the Chairman of the Scientific Committee of C.I.R.S.Pe. (Italian Centre for Research on Fisheries, established by the Italian fishermen association) and a member of the Italian Delegation at ICCAT and GFCM. Italian Focal Point for AdriaMed project of cooperation in fishery research in Adriatic Sea, member of the Italian Commission for management of Fishery; member for many years of European STECF and former President of the Scientific Advisory Committee of GFCM for four years.

Author of both scientific and popular articles on fish biology and fishery, he cooperates with Italian Television RAI Channel in the "Linea Blu" TV for the divulgation of the sea and fishery problematic.

**Axel Romana**

Prospective and Strategy Division, Ifremer, France

Axel Romaña has been working for Ifremer (the French Institute of Research for the Sea) since 1975. After studying theoretical physics, marine biology and biogeochemistry, Axel engaged in multi-disciplinary research. For example, to define and qualify coastal areas in the context of French policy, and the contaminant monitoring network using mussels caging. Or to manage the Programme 'Seine-Aval' where more than 40 french and foreign scientific laboratories collaborated on a multidisciplinary approach to the Bay of the Seine.

Axel developed applied mathematical models for water quality issues in marine/ coastal areas and in large french estuaries (Seine, Loire and Gironde). Led a multidisciplinary team to study the impacts of nuclear power plants located on the french coastline; and another, called 'MEDICIS' to evaluate inputs, state and fate of few chemicals to understand the physics, sedimentary transport, and bioaccumulation in some food chains like hake.

Since 2008 Axel is in charge of coastal environment at the Prospective and Scientific Strategy division. He initiates scientific groups and manages relationships between Ifremer and the French enforcement organizations such as ONEMA, Water Agencies. Chair of the Scientific Advisory Board of Seine and Loire Estuaries, and Member of the international Advisory Group of the European research program TIDE. He was elected in 2010 chair of Marine Biogeochemistry Committee of CIESM.

**Jörn Schmidt**

Sustainable Fishery Group, Dpt Economics, Univ. Kiel, Germany

Dr. Jörn Oliver Schmidt is a specialist in multidisciplinary work, currently Research Fellow at the Group „Sustainable Fisheries“, Department of Economics, University Kiel. He is experienced in zooplankton ecology, fish larvae ecology and fisheries assessment and contributed to EU (FACTS, STORE) as well as national projects (GLOBEC Germany). Currently works on spatial aspects of fisheries management. Co-chair of the ICES “Workshop on Introducing coupled ecological-economic modelling and risk assessment into management tools” (WKIMM) and the “Study Group on Integration of Economics, Stock Assessment and Fisheries Management” (SGIMM). Main contributor to an EU Study on European Fisheries and Climate Change.

He co-developed the game 'ecoOcean' for an exhibition in the German Museum in Munich. This game desk was developed within a project financed

by the Cluster of Excellence “Future Ocean” at Kiel University. It received the ICES “Out of the box” Award (Special Merit Award), ASC Nantes for the “ecoOcean” game. The underlying idea was to develop an appealing device to illustrate the basic problem of fisheries (common pool) to the general public.

### **Vilhelm Skjaerpe**

Co-owner, Media Farm AS, Stavenger, Norway

Vilhelm Skjaerpe has been in the multimedia and interactive media area since 1978, and co-founded three companies in the field. Currently co-owner of Media Farm AS, which he founded in 1996. Vilhelm was educated at The School of Communication Arts in 84/85 and the University of London in 89/90. Before that he was educated as a technical draughtsman. He entered the emerging media sector because of interest. This interest and curiosity are still his driving force today. Over the years this has resulted in a several awards, among them the BIMA gold award in London (1995) in the business communication category.

Today, Vilhelm is Director of developments in Media Farm, a company with 14 employees based in Stavanger, Norway. Media Farm has four business areas: E-learning, interactive games and simulations, corporate video and role-play games. All areas are targeted towards training or learning applications. Main clients are Statoil, ExxonMobil, GDF SUEZ, the Norwegian Parliament, the European Parliament and several visitors’ centres in Norway. A specific area where Media Farm has had a particular influence on the media industry is role-play games. About 12 years ago, Media Farm started the development of their first role-play setup for a regional newspaper. The success of this installation has led to major installations for two other newspapers, for the Norwegian Oil Museum, the Norwegian Science Museum, the Norwegian Parliament, a regional science museum outside Oslo (Vitensenter Innlandet) and The Confederation of Norwegian Enterprise (NHO). A new European Parliament role-play game is in production as well as another for the Garborg centre (an national visitors centre for the writers/poets Arne and Hulda Garborg).

### **Jens Thorsen,**

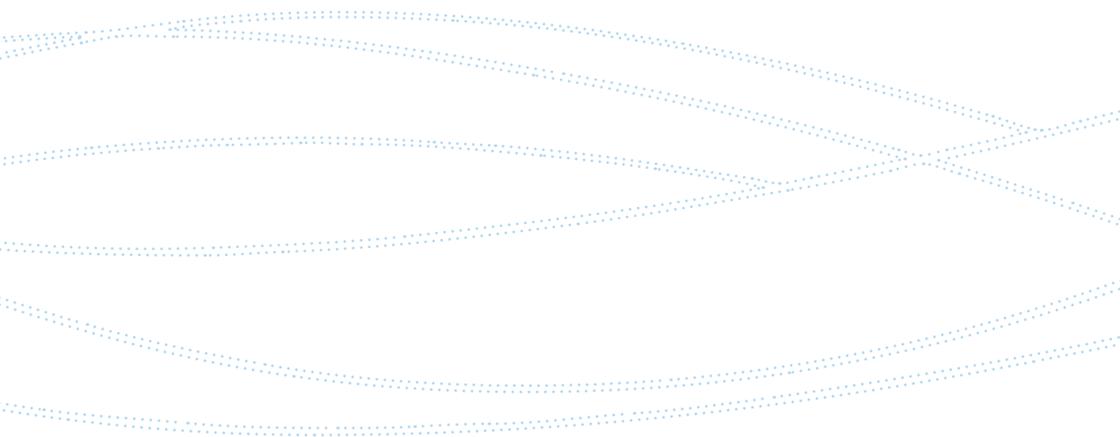
Manager Funkis Multimedia, Göteborg, Sweden

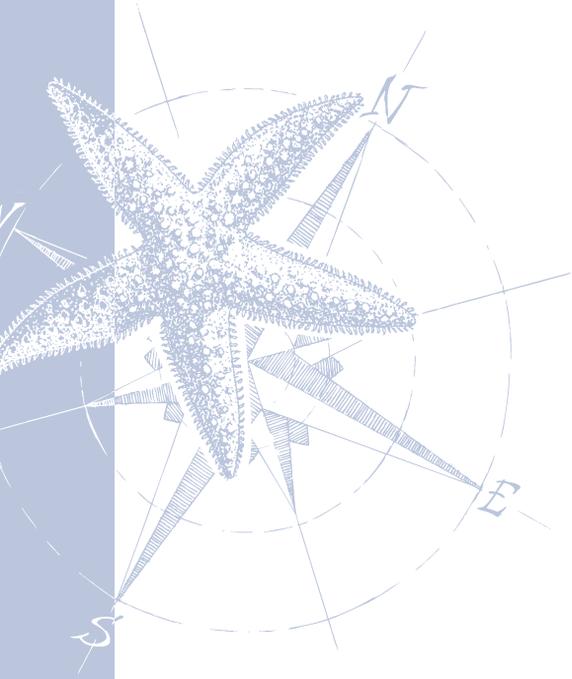
Jens Thorsen has been working with developing interactive education and entertainment since 1992. After his MsSc in Engineering Physics at Chalmers Univ. of Technology, he started the development company Tati, which

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produced multimedia as information and training material for Volvo, Ericsson, Pharmacia, Kvaerner, Astra Zeneca. Parallel with his work as a supplier for global companies, Jens Thorsen developed a knowledge-based CD-ROM game, called BackPacker, which became a huge success in the Nordic countries with more than 700,000 units sold. Between 1995 to 2001, he did lead the development of more than 10 games in the company Vision Park Entertainment, listed on the Swedish stock market.

In 2001 Jens Thorsen founded Funkis Digital Concepts, with the aim to develop concepts for interactive 'edutainment', mainly on digital TV platforms and had a four-year cooperation with TV4, Sweden's largest commercial TV channel. But the future of interactivity, as a tool for deeper insights and understanding, was clearly not in the hands of the TV companies. As a consequence, in 2006 Jens Thorsen renamed the company 'Funkis Multimedia', going back to the roots to produce sophisticated web-based training with game elements, simulations, video and drama. Today, Funkis Multimedia is a exclusive supplier for large companies such as Volvo and Ikea, using highly interactive productions that make it easy to communicate complex messages.





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