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WEB 2.0 AND THE EMERGENCE OF FUTURE ORIENTED COMMUNITIES

Abstract. *Information and communication technologies (ICT) have been largely used in the future oriented consultations (foresight) in the last years. The emergence of the community oriented web (web 2.0) opens a window of opportunity for a new generation of foresight exercises, with a higher interactivity, better focus of expertise, a larger use of Internet resources and, most important, an accumulative content development. The paper describes the framework architecture of a web 2.0 based platform for foresight and describes its properties in the perspective of cognitive psychology and evolutionary economics. The paper concludes that such platforms may represent the basis of future oriented communities able of developing complex databases of future trends related to complex systems.*

Key words: *Online communities, web 2.0, foresight, Delphi method, evolutionary cognitive systems*.

JEL Classification: O33, Z13

Introduction

The collaborative exploration of possible futures, grouped under the generic name of foresight, while receiving an increasing interest all around the world, is undergoing a process of diversification in scope, in the expertise involved, and in the methods used. The initial technological orientation of the foresight has been gradually accompanied by foresight exercises envisaging social challenges or restructuring of various systems[1] (e.g. innovation system, higher education system, regional socio-economic systems etc). The broader approach supported the proliferation of foresight exercises in new fields involving at the

[1] For a review of the foresight scoping dynamics see Cagnin et al. (2008) [4].

same time a larger spectrum of stakeholders. The foresight methods and methodologies (i.e. combination of methods) applied in several thousand exercises carried only in the last years, while benefiting from a strong scientific debate are characterised rather by diversity and customisation than by standardisation.
The diversity of foresight exercises reflects its success as a practice and represents a promise for a growing community, but at the same time raises concerns regarding the usability of the accumulated future intelligence. Most of the results of the foresight exercises cannot be understood outside the context or the scoping of the process, thus affecting the reuse of final results not only by decision-makers around the world, but also in the next similar exercises. A large overlapping of future oriented consultations is estimated, while little progress has been made for developing international databases of trends and high level experts by fields.
Certain initiatives of Internet platforms improved the communication inside the foresight community. For instance, ForLearn[2] platform developed by IPTS Seville provides practical information about foresight scoping and methods, content developed as result of international collaboration. Complementary, the platform of the European Foresight Monitoring Network (EFMN)[3] ensures dynamic access to over 800 briefs of foresight exercises carried around the world.
Taking into account the need to overcome the fragmentation of the foresight exercises, we suggest a ontology for a web 2.0 platform for foresight consultations that could support the gradual development of thematic foresight communities. Methodologically the proposed platform represents an extension of the Delphi method and its adaptation to the asynchronous communication that characterises web 2.0.
Web 2.0 has uncountless definitions, but most experts agree on its behavioural rather than its technological novelty[4], in the sense that online communities enabled new forms of information and knowledge sharing. In these communities, the centralised form of online communication has been replaced by direct interaction of the peers [30].
From the perspective of future oriented consultations, web 2.0 could mark the transition from question-answer approach in online consultations to asynchronous communication and collaborative content development. Taking into account the possibility of maintain the community of experts beyond a punctual consultation, the developed content may also represent a repository and enable accumulation of foresight results.

The potential for extending the Delphi method into web 2.0
The Delphi method represents generically a form of consultation and consensus building about a set of statements about the future. The statements are usually previously elaborated, the Delphi method enabling only their evaluation according

[2] http://forlearn.jrc.ec.europa.eu/guide/0_home/index.htm
[3] http://www.efmn.info/
[4] See also the definition of web 2.0 provided by Wikipedia.

to certain criteria. Specific to the Delphi method are its multiple rounds: after a first round when the selected experts assess the results according to their views, in the following rounds they have access to the assessments made by the others, being able to reconsider their assessment and improve their degree of consensus[5].
Currently a large number of Delphi consultations are carried using electronic questionnaires, and there are already available software systems helping in the construction of the questionnaire, online collection of responses and automatically analysis of collected data. However, ICT in this case does not provide a new dimension of the process, but only an automation of it.
The opportunities of web 2.0 type of interaction go much beyond the initial scope of the Delphi method. Here are some additional features that a web 2.0 platform could enable:

a) The experts may not only assess the statements, but also introduce arguments regarding the realism of the statements or their impact. These arguments may feed the other experts' opinions, thus improving the chance for a consistent consensus. The success of Amazon in rating books based on reviewers opinions show the functionality of such a system. At the same time, the quality of systems like *Wikipedia* [8], [37] proves the possibility of obtaining reliable content in a participative approach.
b) The arguments provided by the experts may include links to Internet resources, transforming the closed system of statements into an open system of content.
c) The quality of each argument for the statements could be evaluated by the other experts. This contributes to the calculation of the probability of the events described by the statements and also to the analysis of the degree of consensus.
d) New statements could be added dynamically by the consulted experts. This would mark a substantial change from the classic Delphi method (where the elaboration of statements and their assessment constitutes separated processes), thus boosting the generative capacity of the system.
e) The experts could focus their input on a small number of statements, which they find closer to their expertise and where they could provide consistent arguments. The concentration of expertise reduces the statistical reliance of data analysis, but compensates with higher quality of the input. Given that the Delphi method relies more on expertise than on statistical representatively, the tradeoff seems a reasonable one.
f) The multiterative interaction enables the replacement of separated consultation rounds by a continuum. This approach may raise concerns about the distribution of feedback between the statements, concerns that need to be overcome by a checking system and explicit invitations for experts to address certain statements.

[5] For a review of the Delphi method literature and applications see Linstone et al. (2002) [19].

The new methodology called Delphi 2.0 includes the logic elements of the classic Delphi and new categories and estimators, as can be seen in the table below.

Table1. The comparative elements of classic Delphi and Delphi 2.0

Classic Delphi	**Delphi 2.0~**
Statements previously determined	Statements previously determined
	New statements
Impact criteria	Impact criteria
Impact estimators	Impact estimators
	Arguments (pro or contra) for the realism of the statements
	Estimators for the relevance of arguments

The possibility of the experts to introduce new statements calls for a system of signalling the overlapping between the statements. This could be made dynamically, the experts signalling the similarities between statements, or it can be made in a specific consultation using a table of overcross estimators similar to the ones specific to the French *la prospective*. In case two or more statements are identified as similar a procedure of merging them should be applied alongside with a recalculating the probability and impact of the new statement.
The primary output of the consultations using a Delphi 2.0 platform regarding the future of a complex system (e.g. the Internet, the national innovation systems) represents, as in the classic Delphi, a list of most important trends according to the calculated estimated realism and impact. Additionally, the consensus analysis may provide very useful information, as for instance, the trends/statements with high number of inputs, but with strong divergence of opinions may become the differentiation variables for a set of alternative scenarios.

A sustainable community development
While in the classic Delphi, the method has a very strict duration segmented in rounds, a Delphi 2.0 consultation may have different timeframes: it could have a cyclical use, correlated with the policy-making cycle in the field of consultation; or it could have a rather continuous activity with the support of an active community.
In the cyclical version, the advantages compared to the classic Delphi are given by the created repository in the previous cycles. These statements with the associated arguments and estimators, although at first instance may seem obsolete, could provide a very valuable input to the current consultations in the perspective of an adaptive vision of the future. The post evaluation of the foresight consultations represents not only a methodological issue, but also an instrument for calibrating the expectations' horizon.

Taking into account the option for a ongoing content development on a thematic Delphi 2.0 platform (e.g. future of universities), one should take into account not only a cost-benefit analysis of such an effort, but more importantly the sustainability model at the community level.
From the literature on online communities[6], proliferating in the last years, several aspects seem relevant in our case:

- The number of communities of practice (distinct from the commercial oriented communities) has dramatically increased in the last years. Most of these communities are quite practical in purpose (e.g. product oriented communities or different disease oriented communities).
- Although there are similarities between the real communities and the online ones, in the letters the participants have a much loose involvement. The distinction between members and non-members is replaced by different degrees of participation.
- Most of the active online communities are based on a relatively small number of dedicated participants.
- Online communities are more dynamic than the real ones - the number of participants can explode in days, but also can vanish quickly.
- The motivations of the contributors in the same community may have a large variety, from intellectual motivations to professional visibility.
- The online interaction is not replacing the real interaction but rather boosting it.

The most spectacular online communities are probably the ones connected to the development of open source software. Open source software phenomenon emerged in the 90's, the number of copies of the operating system running reaching 70 million servers in 2005 (Netcraft, 2005). The contributors are usually unpaid and the supervision is minimal, while the intellectual property rights content are modest [17].The most used licences are GPL (General Pourpose Licence) and BSD (Berkeley Software Distribution). GPL conditions the developers to further publish the resulting software under the same licence. BSD (Berkeley Software Distribution) is not viral, the developers being allowed to exploit their software, conditioned they mention the initiator [22].
A study [16] shows that 29% of open source contributors are motivated by education/intellectual stimulation, 25% by hobby, 25% by professional interest and 19% by communitary reasons. The psychosocial reasons are often connected to signalling, many contributors managing to obtain paid contacts from the software companies.
The contributions' intensity is highly concentrated: between 10 and 15% of contributors provide between 50% and 80% of the elaborated code [9].
The open source model has been extended in other fields [22], as encyclopaedias (see the success of Wikipedia), decoding of the human genome and other tasks from bioinformatics [34] and geographical information systems (GIS). The

[6] See for instance Stoll et al. (2007) [29].

promises for a larger spread of the open source model are high, but the complexity of the stimulation mechanisms remains an important issue.
Less integrated but with higher success have been the online communities sharing video and music content. The participative web competes with the editing industry and television: certain blogs reached larger audience than public television or newspapers, forcing some of them to migrate from providing content to enabling content collection. YouTube with its over 40 million shared video recordings and 200 terabytes of data and the growing number of blogs[7] show that on the Internet the production exceeds the capacity of absorption.
The apparent paradoxical disequilibrium between content supply and demand reveals the power of psychosocial motivations for knowledge production and sharing. However, gathering and orienting expertise needs a very delicate construction of motivation mechanisms. In the specific case of a Delphi 2.0 community the following aspect might prove functional:

- Create a signalling mechanism inside the community. The mechanism should motivate both the experts and the foresight practitioners. The most important aspect of the signalling process is given by the interest of the policy makers and the usability of the platform result for them.
- Combining paid and free expertise would ensure the critical mass that any online community needs. The paid expertise may become also a premium for the active contributors.
- Ensure access to the contributors not only for navigation in the content, but also to the analysis of trends and other statistical data (e.g. graph analyses);
- Enable free access to the repository for punctual foresight exercises. Hence, an exercise carried in a country on a specific issue (e.g. innovation policy) could benefit from the existing repository of trends in that field and easily add context dependent trends.

The relevance of Delphi 2.0 in the perspective of cognitive economics
In the perspective of a long term development, Delphi 2.0 platforms represent evolutionary cognitive systems which go beyond the initial scope of multicriteria analysis of the classic Delphi.
The evolutionary perspective on cognition finds its roots in the Gestaltist theory and proclaims the limits of rational cognition one [14] and the need for a holistic approach of knowledge (i.e. the whole cannot be split in parts). In search for clarity, the individuals' cognitive systems organise knowledge based on similarities or spatial closeness, while the rules are derived from previous experience.
Emblematic for the evolutionary perspective, Jean Piaget describes the process of cognitive assimilation: the new experience is for the first time attributed by the individuals to an existing framework (schema); if the adaptation proves too complex, the new experience results in a transformation of the schema or in a completely new one, process called accommodation [14].

[7] Between a quarter and a half of the young internet users of OECD countries developed a web page according to OECD 2007 [24].

The accepted heterogeneity of knowledge induced a change also in the representation of the problem-solving process. The dominant model in the cognitive pshichology has been for a long period of time that of a path composed of successive steps from the initial stage to the final solution of the problem, the individual applying mental operators on each stage [2]. Once the heterogeneity of knowledge accepted, the main issues of the problem-solving process become the clear identification of the problem and the representation of the options or the definition of the space of possibilities [3].

Experiments made by cognitive psychologists reveal the limits of rational decision making (i.e. the logic deduction from a set of premises). These experiments show that valid inferences are often not identified, while not valid ones are accepted even by persons with supposed high level of rational decision making as the chess players [11]. Legrenzi et al. (1993) [18] explains this phenomenon as result of the individuals' reliance more on mental models than on formal logic. These mental models, dynamically developed in the memory, would base their coherence on the semantic of the content and less on the logic structure. The room for error is given by the elasticity of the mental model (i.e. the results are not strong enough to invalidate the model); the biases of the model itself; or by a focalisation effect (i.e. individuals rely more on the explicit premises of the model). Empirical studies [11] show that individual rely in daily routines on empirical causal inferences. More elaborated procedures are used for the understanding of complex situations, but even in these cases the results are biased by preacumulated knowledge. Moreover, individuals tend to search for confirmation than for infirmation when testing the hypothesis.

In their decision-making the individuals often rely on uncertain inductive inferences. In search for controlling the level of uncertainty, as in the case of identifying the causalities, the individuals apply probabilistic rationality [1], which further relies on the previously assimilated alternatives.

In the last ten years the cognitive pshichology programme converged with the one of the evolutionary economics, giving birth to the new field cognitive economics [33]. Evolutionary economics, while accepting the limited rationality of the cognition stress the ways individuals collaborate in order to improve their cognitive capabilities. The conscientisation of the cognitive capabilities encourages individuals to adapt to the behaviour of the others [5] and to search for common rules [27].

The mechanisms of knowledge sharing and of establishing a common ground for groups of individuals have several theoretical models. One is that the communication in the group gradually contributes to the development of a shared cognitive representation [35]. Stahl-Rolf (2000) [28] considers that the social learning process is based on studying and copying the behaviour of certain individuals considered as models.

Homogenisation of the cognitive framework, while critical for anticipating the behaviour of the others [11] and in the process of codification and decodification of

knowledge in the communication process, reduces the capacity of assimilating completely new ideas [7].
Regarding the shared communication in organisations, Witt (1998) [36] proposes a theory of the leadership inside a company: the leader communicates her vision on the company's mission, vision that should result in time in a shared cognitive representation, helping the coordination of activities. As in the case of non-hierarchical groups, the shared representation has also the disadvantage of reducing the receptivity for radically new ideas [12], including the capacity for technological absorption [6].
The same relativism of shared knowledge has been previously expressed by the philosophers of language. According to Peirce (1868a) [25] all the cognition is interlinked and dependent by the previous accumulated knowledge, and therefore there is no such thing as primary cognition. The reality itself represents the shared meaning at the level of a community (Pierce 1868b) [26]. Wittgenstein also states that language is a social construct, while meaning of the worlds can be reduced to communication conventions.
From the perspective of technical progress, Kuhn (2008) [15] shows that scientific knowledge is represented at least in the first instance as part of a predominant paradigm at a certain moment. Fortunately the similarities in the representations are limited, the existing diversity leaving room for knowledge development [28], [32].
From an evolutionary view, the ability to make logical inferences is relatively recent and not very well developed for the human beings, representing almost a form of artificial intelligence [21]. This view, anticipatory for the model of evolutionary psychology, has been developed by two important economic theoreticians - Hayek and Marshall. Hayek (1952) [10] starting from the premises that the neural networks are precursory to the conscious thought, considers that codified knowledge maintains its roots in tacit knowledge [20]. A similar but more complex model which includes imagination has been proposed by Marshall in „Ye machine" (1994) [31]. Another economist, Keynes replaced in the representation of decision making the categories of rigorousness and certainty of knowledge by that of uncertainty, expectations and degrees of confidence [23].
A Delphi 2.0 platform and community represents in itself a distributed cognitive system which presents strong similarities with the perspectives of the cognitive pshichology and evolutionary economics, namely:

- The *non-hierarchical epistemological value of the statements*, as with Delphi 2.0 there are no primary statements;
- The communication contributes to the shaping of *shared representations* the future;
- The aggregation of statements about the future into a single image relies less on logic than on *semantics*. Focusing and individual biases are embedded in the aggregation process;
- Probabilistic reasoning is the main instrument for evaluating the realism of the statements about the future;

- The system's reason is the *reduction of uncertainty* about the future, the main driver of human cognitive activities [13];
- The dynamics of the system include the *assimilation and accommodation of new knowledge.*

Conclusions

The spread of foresight consultations around the world supports an already large number of foresight practitioners and engages thousands of experts in different prospective exercises each year. However, the horizontal expansion of the foresight practice needs a complementary effort of convergence. Continuing the existing efforts for the aggregation of the community of foresight practitioners is important, but a paradigm change is needed for integrating the very prospective exercises, by eliminating redundancies, signalling the best expertise and most important, develop open access repositories of trends by thematic fields.

Having its roots in the classic Delphi, the proposed Delphi 2.0 platform integrates wiki technologies and asynchronous interaction, thus stimulating the creativity and enabling visibility of consulted experts. Delphi 2.0 can be used not only for single prospective exercises, but also for cyclical foresight and even as a seed for future oriented communities by specific fields. A thematic foresight community may become sustainable around a Delphi 2.0 platform mainly if the system proves open enough and the interest of the policy makers raise the stake for the contributors.

Delphi 2.0 represents the framework of a distributed cognitive system, which has embedded the characteristics of an evolutionary future oriented community.

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