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Political Attitudes
Computational and Simulation Modelling

Camelia Florela Voinea
Department of Political Science,
International Relations and Security Studies,
University of Bucharest, Bucharest, Romania
To My Parents, Puica and Martinel
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Preface

Political Science …

Once strongly conceived by both its schoolmasters and apprentices as an exclusive area of qualitative research, political science nonetheless developed during the twentieth century on experimental research dimensions. This systematic orientation took almost one century to get established on solid methodological and epistemological backgrounds. Though quite long, this process has proved wrong all those who either occasionally or systematically blamed, contested or doubted that political science had tremendous potential for quantitative analysis and an ever-increasing appetite for paradigmatic change.

Otherwise unavoidable, this process of change was sustained and reinforced by technological advances which enhanced the use of artificial media from single computer platforms to computer networks and the Internet. Huge volumes of public survey data put considerable pressure on the capacity of political science methodology to face the challenge of data processing. This kind of pressure demanded a powerful response. All this transformed the exquisite analytical machine, developed and refined over the entire past century, into what has only lately been established as Experimental Political Science (Druckman et al., 2011). This has revealed, first and foremost, how political science has employed experimental research and rich analytical resources to understand, explain and predict political phenomena, no matter if we talk about the outcomes of elections, about the variability of public opinion or about the public perception and the sustainability of governmental policies. This is but one of the trends which explain the methodological and paradigmatic shift toward enforcing experimental research. This has placed the utility of experimental and analytical research beyond doubt. However, utility alone would not be able to describe the ever-increasing research methodological needs in political science. In fact, it has not. Instead, it has complicated the methodology picture in one particular area of political science research: modelling.

It was precisely in the modelling area that the sociological and political methodology research based on empirical data had its golden age: the age of the nomothetic modelling approach working on model-invariant patterns in huge volumes of empirical data. However, it was also here where its decline started.

The modelling area, especially the realm of the nomothetic theory of modelling, proved to be a true battlefield for two competing methodological approaches: while one, namely Experimental Political Science, seems to have lost terrain and prestige as its performances diminish after a century-long dominance and a stable
period of development, the other one, namely *Computational Political Science*, seems to have currently emerged in a sustained (and sustainable) effort to replace the nomothetic modelling paradigm with the complexity-oriented paradigmatic alternatives reinforced by the new artificial life technologies. The nomothetic view in the political science methodological picture has finally run out of breath, crashed by mountains of survey data, rigidly anchored in determinism and model-invariant patterns, stiffened in too static a paradigm.

Notwithstanding high recognition, survey analytical research has been the target of harsh criticism. The reasons, now and then, concern not only measurement issues, but mainly the true capacity of survey data to provide for the modelling of real-world phenomena on large scales and in highly complex contexts. One of the long-standing criticisms against the experimental methods and their analytical approach targets the static perspective provided by the empirical models. In political science research, this issue has a particular relevance, since political phenomena show not only high variability, but also sophisticated degrees of context dependency whose complexity could hardly be captured by empirical data and theoretical modelling. Panel techniques as well as longitudinal analytical studies have thus forced penetration of the mathematical–statistics theories and instruments aimed at overcoming this weakness. Moreover, the subsequently developed mathematical design of dynamic nonlinear variable-based modelling has added value to the analytical power of the theoretical models. Besides the strong requirements for the processing of massive amounts of survey data in empirical research, the study of the space–time unfolding of political phenomena raised one more challenge: complexity. To cope with it, a new modelling paradigm was needed. And this reinforced the demands for a change in political modelling methodology.

In this book we are concerned with this change, which started emerging in political science more than half a century ago. Once initiated, the main problem is to understand where it is heading to.

This change process started in the early 1950s and is still going on. It has merged two modelling schools of thought: modelling in social and political sciences, on the one hand, and computational modelling and simulation, on the other hand. What has resulted from this blending is, perhaps, the most important question so far. Answering this question is not a trivial task, and reflection on this issue has guided the project of writing this book.

In order to answer this question, we need to assume a conceptual perspective on social and political modelling in general and on political attitude modelling in particular. Research in these two areas has met a common boundary.

Let us take a look at their separate histories and the side effects of their merging into a paradigm of evaluation for political attitude phenomena.

… and Computational Modelling

Starting with the early 1940s, the computational modelling approach began to take shape in both theoretical and experimental research. John von Neumann and Oskar Morgenstern’s ([1944]2007) work on economic behaviour laid the foundations of
game theory, but also the foundations of a new approach in modelling theory: computational modelling. The decade between the mid-1940s and the mid-1950s brought the fastest, the deepest and the most amazing advances in computer technology, memory storage capacity and computational speed (Forrester, 1989). It was also the time when digital computation techniques, though in their infancy, suddenly got a modelling flavour, making the same decade and the next one appear as a time of explosive computational modelling development. Jay Forrester laid the theoretical and experimental foundations of the computational modelling of complex systems like organizational, economic and social systems (Forrester, 1956, 2003, 1958, 1961, 1964). As theorized by Forrester in the early 1960s (Lane and Sterman, 2011), system dynamics was the first computational modelling paradigm which applied to the study of structural and behavioural dynamics of social systems. In this paradigm, computational modelling is approached in terms which distinguish between three fundamental concepts, that is, the real-world system as the modelled system, the computational model and the simulation of a computer model, which is necessary in order for the model to exhibit its (designed) behaviour and provide (expected or unexpected) outcomes to be evaluated.

The same period of time covers some other famous theories which marked the later development of computational modelling theories, like Simon’s (1957, 1972) works on bounded rationality as a modelling theory of decision-making, and the works in social communication and persuasion developed by Carl Hovland and his collaborator, Milton Rosenberg, in the Yale Team (Rosenberg and Hovland, 1960).

It was against this background that electoral studies in general and political attitude studies in particular employed computational modelling as a research methodology. It was perhaps too soon for doing so in political science.

In political science research, the process of paradigmatic change, going from qualitative to analytical and experimental, started to diversify itself. The preferred area was that of electoral studies. At a glance, the history of the American presidential election studies offers a picture of the first challenge: it was during the 1950s that a computational modelling approach seemed to raise for the first time a serious methodological challenge. Two decades later, it became a prevailing one, taking the community somehow by surprise, since very few political science researchers were mastering computer skills in order to face the challenge. By the end of the 1970s, computational modelling research finally took an independent position from the empirical and experimental branch, and issued some true characteristics of a new branch within classic political science. The beginning of the twenty-first century found the political science community facing a delicate question: Is there a ‘Computational Political Science’ about to be born?

The boost in computational modelling on relevant political science issues appears to be a puzzle in which the computational modelling of political attitudes is but one of the numerous (known or still unknown) pieces: would this turn into a labyrinth-like puzzle? The computational modelling of political attitudes is but the thread which helps any wanderer achieve a map of this quite sophisticated world and, eventually, find a way out. It is this puzzle that has challenged the construction of this book such that it could achieve its specific structural, explanatory, and prospective goals.
Out of the Shadow

Political attitude modelling might seem to many a quite narrow area of research. Often included in public opinion survey research, individual and collective behaviour research, or in research on beliefs, values or normative systems, political attitudes have always represented a very sensitive poll subject and a too-complex modelling issue for the analytical power of empirical research. No matter how strong or weak such research approaches are, they are meant to provide answers to the questions concerning the dynamics of political attitudes and the role they play in understanding the short-, mid- and long-term evolutions of political regimes, governance strategies or policies. The societal demand for these answers is continuously increasing, and the pressure it exerts on political regimes is considerable. Political, social and economic crises, as Europe and the world at large have known during the past years, have emphasized once more the strong societal need for preventing political deadlocks by modelling polity dynamics and predicting its potential contextual evolutions.

As an area of research, the political attitudes domain is anything but narrow. As a matter of fact, its complexity has often narrowed the type of research approach, making it, for quite a long time, a preferred issue for the development of measurement theories and methodologies in public survey research. It is only lately that political attitude modelling research has employed computer technologies and computational methodologies. This has increasingly and considerably opened this subject to sophisticated modelling research.

It is the computational modelling of political attitudes that has effectively got this issue out of the shadow in which it was waiting for more than half a century. Offered thus plainly for a much wider range of research instruments and complex types of investigation, the issue has proved unexpectedly precious for a number of research areas with a quite huge social and political impact: political psychology, political marketing, political persuasion and political communication in electoral campaigns. Not to mention its being highly valuable in impact studies over the high-risk investment and financial sectors and in financial market research. But first and foremost, it has proved far more valuable for an area of political science research that has been regarded for a long time as a Cinderella: political culture research.

Past Challenges and Answered Questions

This book aims to reveal the power of computational modelling of political attitudes to contribute and to reinforce political science research in facing two fundamental challenges.

One such challenge is the renewal of political methodology, long requested, explained and particularly voiced by Charles Tilly (Tilly, 1995, 2001; McAdam *et al.*, 2001; Goodin and Tilly, 2006). This book aims to present the history and
arguments of how political attitude computational modelling has provided the means for methodological advances in political methodology. Each chapter in the book approaches such a research methodological dimension. This is meant to explain the roots of methodological change in political attitude modelling research and what it is heading to.

Another strong challenge is the emergence of a new discipline, namely, Computational Political Science. This might happen in much the same way as Computational Sociology emerged in less than two decades of social simulation research (Squazzoni, 2012). This book tries to aggregate the available research literature and technical reports in searching for the critical mass of qualitative contributions which could provide for a new appearance in the political science range of disciplinary fields.

Both challenges are meant to show that political attitudes – important as they are in political psychology research, with all its implications in areas connected to political participation and collective action – are far more important in political science research for their potentially major implications in explaining both micro-to-macro and macro-to-micro polity phenomena.

The construction of an artificial polity model has already been approached by several authors all over the world. However, so far it has not proved as effective or as robust as the artificial society model. The explanation we are trying to provide is that a macro polity model and an artificial polity research instrument could hardly be effective without a political attitude and, by extension, a political culture basis. To this end, this book on political attitude computational modelling provides the first brick.

Approach

First, the book follows this process of transformation in conceptual and operational details such that it can reveal the substance of this major paradigmatic change from empirical to computational type.

Second, it evaluates the relevance of the main modelling approaches to political attitude. Political attitudes prove their relevance to two fundamental areas in political science: political psychology and political culture. Both are relevant for modelling political participation and decision-making in mass publics. Moreover, political culture seems to play a role which might prove essential in feeding the macro (emergent) phenomena back into the micro level of individual behaviours, preferences and choices. The evaluation of the relevance goes from the conceptual level to the operational and the simulation levels of the model.

In order to emphasize the way in which political attitude modelling research has discovered computational technologies and employed them in the working methods, a few basic details are provided about each dimension of this subject: the political attitude dimension and the computational modelling dimension.
Goals

The goals of this book are many: structural, explanatory and prospective.

Structural goals are working goals; they guided the structuring of the initial puzzle of political attitudes modelling approaches as a collection organized on several explicit dimensions which have divided it in ‘parts’. Each ‘part’ thus includes a collection of modelling approaches which satisfies requirements concerning (i) some fundamental contribution to political science research (either conceptual or methodological, or both) and (ii) the relevance of the approach for political science in general and for political attitude and culture research in particular.

The structural goals are meant to organize the initial puzzle of models on several dimensions: historical (temporal dimension), theoretical (conceptual dimension) and operational (methodological dimension). Structuring it, however, is not an easy task. The structural dimensions have been identified and approaches have been selected such that each modelling approach satisfies all criteria (all requirements concerning history, concept, method and relevance).

The chronological dimension was meant to emphasize the history of the development of both conceptual and technological aspects. These two classes of aspects – conceptual and technological – concern both political attitude modelling research and computational modelling research. Moreover, the issue of ‘computational modelling of political attitudes’ involves the ‘merging’ of different (and often independently developed) conceptual and paradigmatic approaches into a single unifying approach, like, for example, the JQP model, which integrates in a single unifying modelling approach several conceptual models developed in attitude research (political information processing, remembering and cognition), on the one hand, and in the artificial intelligence and semantic networks, on the other hand.

Explanatory goals are meant to explain the outcome of a particular combination between concept and method in the computational modelling of some political attitude issue, like change. Such combinations are usually constrained by the fundamental modelling requirement of analogy between model and real-world phenomenon. It is based on the capacity of the model to represent and reproduce or replicate the real-world phenomenon which the modelling approach is actually addressing.

The combinations between mechanisms in political and social science modelling, on the one hand, and the mechanisms in computational modelling, on the other hand, constitute one of the subject matter of our approach in this book. Such combinations are subjects of endless debate in the philosophy of science as well as in political philosophy. What is truly relevant to the approach in this book regards a particular, however essential, characteristic of computational modelling: models, no matter if computer models, artificial intelligence models, semantic networks, neural networks, agent-based models or cellular automata, need simulation in order to produce outcomes. These outcomes are used to evaluate the model’s relevance, validity and effectiveness. Extending and adapting from the way Hartmann (1996: 82) put it, modelling such combinations of psychological, cognitive, social and political
mechanisms is a matter of simulation, that is, a matter of reproducing some mechanism(s) by other mechanism(s).

Finally, the prospective dimension of this approach is far-reaching; it is meant to reveal the role and the contribution that computational modelling of political attitudes might have on the emergence of a new (inter)disciplinary field within political science. Social simulation and computational sociology have become a fundamental reference in this respect; this reference suggests that political science might experience the same phenomenon of disciplinary diversification by the emergence of a new discipline able to involve new (computational and/or artificial life) technologies as support for new research methodologies and new philosophy of modelling approaches.

The Picture

This book is meant to offer a comprehensive picture of the past 80 years in the computational modelling of political attitude research. The book aggregates, for the first time, an overall picture of this field of research by including several most relevant modelling approaches of political attitude phenomena, including various references to the connected issues of (political) belief, value, knowledge, information processing, cognition and behaviour research.

This picture includes different pieces of interest in political attitude research, from the original social attitude measurement research initiated at the beginning of the twentieth century to the highly sophisticated political attitude change models elaborated at the beginning of the twenty-first century. It is meant to reveal the main orientations in political attitude research by uncovering the conceptual roots, the influences induced by other disciplines, and the tendencies emphasized before and, especially, after the computational modelling technologies were adopted and included in the political attitude research methodologies. Besides a state-of-the-art of this field of research, the book aims to reveal the type of contribution this field might have to political science research in general and to polity modelling in particular.

Since the early days of social and political psychology research, political attitude research has been traditionally developed on an empirical basis. Computer technologies as well as modelling theory offered during the 1950s the necessary support and motivation for approaching classic political science research issues. The best example is represented by the issues usually approached in electoral studies, like the aggregation of voting preferences during electoral campaigns. Computational modelling has transformed political attitude research, traditionally anchored in the public survey paradigm, into a spearhead of political methodology change.

Political attitude research has succeeded in overcoming its own limitations, long induced by the intensive use of self-report methodology used in collecting survey data, by the early inclusion of explicit modelling aspects, like the evaluation of patterns in the aggregate data which were aimed at serving explanatory purposes, and prediction. The computational modelling era in political science research, in particular in political attitude studies, was initiated during the 1950s, when the
computational modelling methodologies were introduced in the American univer-
sities and research laboratories with a special focus on electoral studies. This difficult
transformation from a qualitative type of research to the experimental and, finally, to
the computational type has materialized in a long list of paradigms, both conceptual
and methodological, which have been employed in this area of research. The results
are not fully obvious, and the long-term effects of this change process are still to be
evaluated.

Camelia Florela Voinea
University of Bucharest
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Introduction

A Half-Century-Long History

Attitude is one of the fundamental concepts in social psychology. A long and complicated conceptual elaboration process was needed to define it. As a late outcome of the philosophical debate on the ‘mind–body’ problem, it goes beyond this classic separation, identifying a locus of human choice and action. Around the mid-nineteenth century, scholars began thinking of it as a sophisticated concept which combines issues from psychology and sociology, philosophy of mind and philosophy of cognition, emotion and rationality, moral and action. Associating it with the complex process of the historical separation of psychology from philosophy, attitude has become the fundamental concept of a new discipline which emerged at the beginning of the twentieth century: social psychology.

Social psychology has aggregated various research interests in concentrating on attitude studies. As previously spread in various scientific areas going from experimental psychology and psychophysics to sociology or philosophy of mind, this multidimensionality richly endowed it with a strong and deep interdisciplinary character. At the beginning of the twentieth century, when the fundamental research on attitudes started being systematically developed, it was basically focused on definition and measurement (Thurstone, 1928; Thurstone and Chave, 1929; Allport, 1935).

Along with the social psychology research developed in this very period, another domain has addressed the issue of attitude: political psychology. Social psychology has approached attitudes in a more quantitative fashion induced by the strong orientations towards behaviour, experiment and measurement inherited from the psychological research framework of the time. As a noticeable difference, political psychology has approached the concept from the perspective of the individual personality, much dominated by Freudian psychoanalysis and moral evaluations (Lasswell, 1936, 1948).

In a short while after their foundation, both social psychology and political psychology underwent drastic paradigmatic changes. The first wave of change came during the 1950s and was induced by the ‘behavioural revolution’, which seized voting behaviour modelling research for a long time. Despite its indisputable supremacy, the behaviourist paradigm fell into disfavour by the end of the 1970s. It has never truly recovered, though it has never truly surrendered either.
The second wave of change came with the ‘cognitive revolution’. Under the strong impact of the New Look, both social psychology and political psychology changed views. Social psychology replaced the functional paradigm based in behaviourist thinking with the cognitive consistency paradigm, and the Pavlovian ‘stimulus–response’ (S-R) model of behavioural response to stimuli with the force field model (Katz, 1989). The New Look had a strong impact on political psychology as well, such that the domain opened up for the age of electoral studies: voting behaviour and political belief studies dominated the political science stage until the late 1980s when the issues of political information processing, political judgement and political cognition took the lead. Sustained and stimulated by the influence exerted by social psychology experimental research, political psychology re-emerged during the 1970s and redefined its domain by including an orientation towards empirical experimentation (Kuklinski, 2009; Druckman et al., 2011; Holbrook, 2011; Iyengar, 2011).

Political attitudes were included in the early experimental developments within social psychology research as a particular kind of attitude traditionally associated with the political space, and especially with the area of electoral studies. Studies of electoral campaigns, candidates and voting behaviour proved, however, that along with social contextual variability, political attitudes underlie the variability arising from both the individuals’ cognitive characteristics and the way they relate to the issues of social and political life. As attitudes address the most basic as well as the most elevated dimensions of social and political life, the interest in political attitudes has thus generated new frontiers in both social and political sciences’ fundamental research by adopting, among others, new methodologies able to cope with the challenging aspects of studying political attitudinal phenomena at the mass level. Modelling, in particular computational modelling, provides for such a methodology. Its impact on political attitude research increased while stimulated by the modelling approaches developed in psychology, sociology and social psychology.

In social sciences, modelling has been used to explain and test theories, improve old ones and build up new theories. To put it in just a few words, the classic nomothetic modelling paradigm is basically a reductionist method to achieve a representation of a real-world phenomenon. This representation employs a universal principle able to explain why a real-world phenomenon looks as it looks and not otherwise, and why it behaves as it behaves. It has been intensively, and for a long while almost exclusively, used in the empirical research for acquiring causality-based explanations of a given phenomenon by identifying the universal law which governs its behaviour. Computational modelling has pushed classic modelling beyond its traditional concepts and limits. The explicit purpose has always been that of achieving more believable models and better explanations.

The computational modelling paradigms have been appreciated for their capacity to bring forth an optimal compromise between the model’s complexity and the complexity of the real world: models succeeded in preserving as much as possible from the complexity of the real-world phenomena such that their relevant aspects could still be replicated and systematically varied.

In political science, modelling has been employed in its classic mathematical form as a way of expressing a theory by means of a system of equations. Such a model takes
on what is relevant about a real-world phenomenon so as to explain one or more of its structural, functional or behavioural aspects. As a fundamental difference, computational modelling allows for the translation of a theory (mathematical model) to a computational form, thus making possible the model construction and operation in virtual media. The main advantage of virtual experiments resides in their considerable power to tackle data and complexity without the need to involve human subjects in time- and resources-consuming, error-prone field experiments as traditional empirical research does. Computational media allow for virtual experiments which could be repeated as many times as needed without requiring human intervention and the repeated exposure of human respondents. Moreover, simulation modelling technologies which are often associated with computational modelling allow the replacement of empirical data with generated data, thus reducing the field work or simply avoiding the traditional empirical data collection aimed at model testing. The simulation modelling of the real phenomena provides for both top-down designs, which are more appropriate to rationalistic models, and bottom-up designs, which are appropriate to the models based on self-organization and emergence.

There are other aspects, however, which have fuelled the endless hot debates concerning the meaning of the patterns and of the type of outcomes such simulations provide. Epistemological considerations have long been the battlefield for the pros and cons with regard to the appropriateness of the method for the study of the dynamics of political attitude phenomena in artificial social systems. Though contested and criticized from both inside and outside of social and political methodology areas, the computational modelling of political attitudes (with or without simulation modelling) has provided the proper means to achieve considerable advances in explaining the phenomena generated by political attitude formation and change processes. Such advances would not have been possible on an empirical basis alone.

**Emergent Area**

Computational modelling has appeared in political attitude research as an auxiliary means of supporting the necessary calculations in the analytical data processing. The first goal it has served is that of increasing the efficiency in the processing of huge amounts of survey and panel data. Thus, from the very beginning, it has played a constant role in enhancing the explanatory and predictive power of an empirical model of individuals’ political preferences and voting choices. Such descriptions were employed by the Columbia Model, the first model to be translated into a computer simulation model of political attitudes, aimed at predicting the political voting choices in U.S. presidential elections. With time, the range of such phenomena has been extended and diversified so as to include not only the relationship between political attitudes and voting behaviour but also their relationships to political beliefs as in the Michigan Model, or political information processing, judgement and cognition as in the John Q. Public (JQP) Model. It has also diversified as a reaction to the fast technological and methodological advances, but also for raising
awareness of the increased relevance of the role it could play in providing accounts on the complexity of political attitude phenomena and explaining their dynamics.

Nowadays, political attitude computational modelling research is meant to provide answers to rather complicated questions concerning the political preferences, choices, behaviours, judgements and cognition in individuals, groups and entire societies. The computational aspects combine more often and in increasingly sophisticated ways with simulation modelling technologies and employ sophisticated simulation instruments and media. During the past decade, this mix has offered the most interesting suggestions for understanding what roles information, communication, persuasion, symbols and emotions play in shaping, influencing or changing individuals’ and groups’ political evaluations, judgements, deliberations, action choices and attitudes.

Notwithstanding its impressive, though rather short history, political attitude computational modelling appears as an advanced area of research with powerful approaches in almost all political science aspects from elections, ideology, decision making and polity to interaction, information processing, communication and cognition.

However, one thing should be noted in the first place: political attitude computational modelling is not properly what one might call an established area of research. It might rather be viewed as one which is currently emerging from a puzzle of modelling approaches spread in many areas of psychological, sociologic, social-psychological, political and economic research. Accumulating a considerable amount of knowledge and methods, political attitude computational modelling seems to make a political science dream come true, that of endowing political science research with a methodology able to provide appropriate support for modelling the complexity of political phenomena. Though not the only one, but perhaps one of the most advanced, it undoubtedly represents a potentially relevant component of a newly emerging discipline of research within the political science domain: a computational counterpart to the already established and highly recognized Experimental Political Science.

First and foremost, political attitude computational modelling brings forth a precious modelling experience and methodology in a political science area which has long proved resistant to change: political methodology. It has been a long while since several political science scholars, especially Charles Tilly, strongly argued and voiced their demands with regard to the necessity of methodological change from the classic nomothetic to other modelling paradigms able to cope with the variability, complexity and dynamics of political phenomena.

Now and Then: Methodology Inertia

The experimental approach has long been a disputable aspect in political science research and remains debatable notwithstanding its impressive advances and the paradigmatic changes it has induced. The experimental research methodology took more than a century to get accepted and systematically employed in political methodology. It is only a couple of years ago that experimental political science acquired an established, highly recognized status and confirmed the decisive role it plays in political science (Druckman et al., 2011).
Its massively dominant status has nevertheless been ‘threatened’ during the past half-century by a different kind of methodology and epistemology: the arsenal of computational technologies and methodologies based on the virtual experiment, complexity and generative data has undermined the strong, dominant position of the empirical tradition in both experimental and modelling research. The introduction of the new methodology has faced strong opposition. Now and then, ‘methodology inertia’ manifests itself in the same way.

For the particular area of political attitude research, experimentation has been fostered by a massive influence from social psychology research methodology. Notwithstanding formal agreement of the political science research community on the concept and acknowledgement of its utility, experimental research has often faced opposition from scholars who proved resistant to accepting the new methods and techniques of quantitative evaluations. Their opposition was rooted in a traditional qualitative style of scientific investigation. The opposition to the challenge of methodological change has usually been approached with interdisciplinary training programmes aimed at stimulating methodological interest and training those interested to get new skills and to make use of them. In the political psychology of the 1970s, for example, the opposition towards the experimental research approach was tackled with consistent long-term programmes of interdisciplinary training of doctoral and post-doctoral fellows, a tradition initiated at Yale University with an interdisciplinary psychology–politics programme (Iyengar, 2011). Things are not much different nowadays: the same kind of concerns are given academic support in undergraduate and graduate programmes to both students in political science and mature scholars willing to use the computational and simulation tools (Yamakage et al., 2007). This book is aimed at serving this purpose and enduring initiative.

Computational modelling, as well as computational simulation research, has faced this challenge too. The difficulties in getting accepted as modelling research methodologies in political science have concerned the high levels of demanding skills and knowledge about computational technologies. Evaluating the research community’s response to this challenge, Paul Johnson identified a phenomenon which was generalized in social and political sciences during the 1950s and the 1960s: the methodological background of many political science researchers was consistently based in survey methods and analytical tools and much less in computer science, programming skills and even less in computer simulation (Johnson, 1999, pp. 1511–1512).

Approached mainly in the context of theories of democracy, the modelling of political change phenomena required, in the early 1990s, a modelling paradigm change, extensively explained and strongly advocated by Charles Tilly (1995, 2000, 2001). His formulation of the problem was the most direct and, perhaps, the most demanding in what regards the necessity to develop research methods able to cope with the variability of political phenomena, with the recurrent nature of political change processes, and with the context- and path-dependent dynamics of its spatial and temporal evolutions. Moreover, as he explains, the empirical variable-based, model-invariant design needs to be replaced by a design based on mechanisms and processes, more prone to uncover the dynamics of phenomena (Tilly, 2000, p. 4). Tilly shows that the dynamic variability of the contextual processes does influence the way political processes are described.
and explained. Model-invariant explanations are often too much reductionist since they actually eliminate context. Providing as illustration an example of a village drama in Romania after the 1990s, when people demanded the restoration of their land property rights held before the communist regime came into power, Tilly requires a political process modelling which should take into account the context as it enhances the identification of regular patterns which characterize political phenomena (Goodin and Tilly, 2006: 6). A similar position has been advocated by other scholars in various areas of social and political sciences: in political science by Lars-Erik Cederman (1997, 2001, 2005), and in social science by Charles Taber (2001).

Notwithstanding such strong positions as well as the criticisms formulated by these and other scholars, the paradigmatic conservatism in political methodology once again proved its resistance to change. Compared with similar methodology revision programmes in sociology and social psychology research, the means to make a political methodological change programme operational and efficient remained poor as long as experimental political science seized the methodological resource. The nomothetic modelling paradigm in the experimental research acquired too powerful a tradition to easily make room for change in political methodology. For a long while, mathematical and empirical modelling not only dominated the methodological scene but also took over the view.

When noted, and finally agreed and accepted, political attitude computational modelling already had a rich past and was looking ahead to a richer future. Not to speak about the political culture theory, a graceful host for much of the latest approaches in political attitude modelling research (though not fully computational). Political attitude computational modelling research thus appeared much as a methodology provider whose know-how was developed outside political methodology or at the thin border between social and political research methodology. Its value cannot and has not been denied in political methodology, but it has not been praised either. As regards its contribution to the classic political methodology, it brings the conceptual and operational means as well as a rich experimental background for approaching the dynamics, recurrent nature and the context-dependent aspects of political change processes.

First Research Programmes

The first systematic computational modelling approach of political attitudes was initiated in the late 1950s by a Columbia sociologist, William McPhee, who had the idea of evaluating the public survey data on a computational basis. McPhee is credited as having actually discovered what a political attitude computational model in reality is, how it works and what it does: his page on the Columbia University website, carefully maintained by one of his early collaborators, Robert B. Smith,1 reminds us of a great mind and a visionary research programme leader.

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1 I hereby acknowledge and appreciate the precious advice of Dr Robert B. Smith in understanding the spirit and the technical details of the research work he developed together with William N. McPhee during the 1950s and 1960s.
At that time, both computers and public survey methodology were used for the first time in such research: the computer programming tasks required skills almost unknown in social and political research, while surveys brought such huge amounts of empirical data as to require a ‘calculation machine’ for providing the analytical results. McPhee designed a computer simulation in which a three-process system was able to associate individual voting choices with several dynamic variables describing the individual preferences, and the local social context: the dynamic variation of an individual’s internal predisposition towards one or another of the candidates in the presidential campaign was associated with the variation in the individual’s interest in political participation. This relationship was subjected to the political persuasion exerted by the electoral campaign media communication. The classic paradigm of the small worlds in which the local community survey was crucial for predicting the outcomes of the voting process, provided relevant support to the idea of modelling the role of the social context in shaping individuals’ political attitude towards voting and voting choice. As opposed to the Columbia group of sociologists, the Michigan group introduced a new paradigm which simply left the other one in the shadow. However, the computer simulation idea was kept alive in an ambitious project defined at the end of the 1950s by William McPhee and James Coleman, thus becoming the cornerstone of the fundamental research programme in social and political sciences for the years to come. They introduced the idea that computer simulations could provide appropriate support for the analytics of voting choices in the aggregate data, thus assisting the scale-up of the investigations from the individual level to mass electorates and approaching them in their real complexity (McPhee and Coleman, 1958, pp. 6–9).

Early political attitude research employed computational modelling mostly with respect to the individual level. As this area of modelling research accumulated expertise and struggled to respond to the ever-increasing demands of societal and political programmes, it changed not only the paradigms but also the target, addressing the issues of political attitude formation and change in the aggregate. Although traditionally modelled by means of empirical approaches, the micro–macro relationship was approached in political attitude computational and simulation modelling research on a complexity basis, providing the framework for the study of the emergence of structure and order at both the society and polity levels.

It took a long time until this idea was properly revived by Thomas Schelling (credited as the early founding father of the social simulation approach to the emergence and dynamics of social change under social influence) and Bibb Latané (credited as the founder of the computational and simulation modelling approach to the emergence of political attitudes under social influence) at the beginning of the 1980s. It took, however, not only time but also a profound change in the research methodology, which was stimulated by the ‘cognitive revolution’ in both social and political psychology research. The computational modelling techniques much based on the sciences of the artificial, namely artificial intelligence (AI), artificial life (ALife) and artificial autonomous agents (AAA), have proved decisive for the theoretical advances in many research domains, political attitude research included.

Modelling of political attitudes was, for a long time, a subject of empirical research in voting behaviour, electoral campaigns, public opinion dynamics and the elites’ role in influencing voting choices of individual voters. Starting in the
mid-1980s, the traditional empirical paradigm was paralleled and then gradually replaced by the computer simulation paradigm. In almost half a century, the former, while leaving the front stage, has actually achieved high recognition and scientific status as Experimental Political Science (Druckman et al., 2011). The latter remained inconspicuously expecting a true change, while benefiting enormously from the burst of computational and simulation technologies developed in this time period. In less than a decade, the computational modelling of political attitudes turned into the most relevant research endeavour in political science.

Once it accumulated a critical mass of theory and method, this area of research provided the most relevant contribution to the newly emerging Computational Political Science.

The Challenge of Political Culture

Political attitude computational modelling research witnessed a stable systematic development during the 1980s. It had, however, grown up in a scientific and political context whose sensitive dynamics exceeded by far the capacity of available research methodologies, resources and technologies to cope with. As many times before, computational and simulation modelling methodological resources in sociology and social psychology surpassed those of political science in what regards the capacity to approach highly sensitive, non-equilibrium social and political phenomena. The burst of social simulation and computational sociology domains and their associated research methodology proved once again that these social science domains acquire faster the new modelling technologies offered by the theories developed in the sciences of the artificial: AI, ALife, AAA, artificial neural networks, cellular automata (CA), multi-agent distributed systems (MAS), agent-based systems (ABS) and complex adaptive systems.

Political attitudes, as traditionally approached and modelled by social psychology research on public opinion dynamics, witnessed the painful decades-long passivity of the political methodology field in the face of technology-based advances in the modelling research methodology. What actually triggered the process of massive methodological change in political science was an old-fashioned theory, equally praised and contested during the 1960s (and ever since): political culture theory.

Though classic already, as introduced by Philip Converse (1964), political culture theory has never been approached from a computational and simulation modelling perspective, and even less in association with, as a basis for, or as a far-reaching goal of political attitude computational modelling research. This trend has nonetheless become more visible in a wide range of political attitude modelling approaches which include almost all aspects from ideology to polity dynamics. The gradual shift of research foci and paradigms from electoral and voting models to political culture models is one of the most complex evolutions induced by the development of computational modelling of political attitudes. The trend, initiated in the mid-1960s and left aside for several decades, has lately become a true cornerstone of the theories concerning political regime shift from authoritarian to democratic and participative ones.