Giddens' globalization: Exploring dynamic implications

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Abstract

The dynamic complexity of the social phenomena that people bundle together and call 'globalization' accentuate a divisive public discourse with strong arguments for and against the globalization process and its effects. To help unearth the dynamic processes that support or inhibit *globalization*, this article shows the recursive relations and mutual causal links among technology, institutional structures, beliefs and social behavior, which sociologist Anthony Giddens has posited on globalization. Giddens' sociological analysis of the globalization process incorporates not only favorable conditions, such as the development of telecommunications technology and world economy integration, but also political transformations, transnational corporation growth, and cultural effects. These concerns outline the components of a system dynamics modeling example, the experimental and model analysis results of which allow reflecting on Giddens' sociological globalization positions.

Keywords: *globalization, Giddens, social policy, political philosophy, system dynamics (SD), information and communication technology (ICT)*

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Globalization, as the history of this phenomenon shows, is a notion that economists, political scientists and sociologists often exploit. The notion has lost its expressiveness because people use it to describe phenomena that escape from precise or unambiguous definition. As the 2008-09 world financial crisis shows, the globalization process requires detailed, in-depth analyses because in its economic dimensions globalization is not the distant virtual world of figures and financial transactions, but a phenomenon that directly influences peoples' daily life.

A widely cited sociologist, Anthony Giddens, former director of the *London School of Economics* and an adviser to the former British Prime Minister Tony Blair, writes about the globalization process. According to Giddens (1990, p. 64), globalization is "the intensification of worldwide social relations which link distant localities in such way that local happenings are shaped by events occurring many miles away and vice versa", thereby changing all aspects of our everyday life.

This article looks at Giddens' globalization with the systems dynamics (SD) modeling method (Forrester 1958, 1961, Sterman 2000). Lane and Husemann (2008) argue that SD can highlight the possibility that markets can shape human preferences, but human preferences in turn create, replicate and challenge market structures. They see globalization not simply as a gathering of phenomena and processes isolated from acting people, but as a phenomenon that influences human beings, but human beings also can steer its process, a notion that harmonizes with Giddens' (1983, 1984) ideas.

First, the article looks at Lane and Husemann's (2008) globalization benefits causal loop diagram (CLD). Building on arguments by Friedman (2000) and Held *et al*. (1999), Lane and Husemann focus on innovation and wealth creation reinforcing feedback loops that might account for the perceived benefits of globalization (Fig. 1). Lane and Husemann go as far as to cite Friedman's view that such reinforcing processes might even lead to the improvement of quality of life standards beyond economic conditions, e.g., freedom of press in China.

Next, the article embellishes Lane and Husemann's (2008) globalization benefits CLD with Giddens' highly interwoven globalization dimensions (Fig. 2), placing individual citizens' quality of life on top of their causal map. The new, extended CLD (Fig. 3) incorporates Giddens' globalization positions on both the prospects and the problems of globalization.

The extended globalization causal map is *one* of the contributions that this article makes. *Two* is the translation of a few seemingly diverse globalization components into a computer

simulation environment that allows addressing some of Giddens' specific concerns. As the computed experimental results show, this bite-size SD modeling example generates the overshoot and collapse dynamics of employment in a small developing country.

The *second* contribution that this article makes stems from articulating exactly how elements common to generic overshoot and collapse structures interact through time (Alfeld and Graham 1976, Andersen *et al*. 2003, Georgantzas and Katsamakas 2007, 2008, Mojtahedzadeh, Andersen and Richardson 2004, Zagonel *et al*. 2004). The SD modeling process can help managers and policy makers articulate exactly how the structure of circular feedback relations among variables in the system they manage determines its performance through time (Forrester and Senge 1980).

By definition, globalization is a dynamic process. But most existing globalization models are merely textual and diagrammatic in nature. Given our current globalization situation, in order to determine if a prescribed idea or policy can generate superior performance, policy makers and country managers must mentally solve a complex system of differential equations. Alas, relying on intuition for testing logical consistency in dynamic business processes might contrast sharply with the long-certified human cognitive limits (Morecroft 1985, Paich and Sterman 1993, Sastry 1997, Sterman 1989).

Well aware of these limits, the article gives a brief overview of the SD modeling method and shows its value, along with the use and benefits of SD model analysis with Mojtahedzadeh's (1996) pathway participation metric (PPM). The article dares to ask how and why the SD modeling example produces the results it does. The PPM detects exactly how changes in loop prominence determine system performance. The model analysis results show that, over nine distinct time phases, six different feedback loops become the prominent causal paths that generate employment dynamics through a five-year time horizon (60 months).

After Lane and Husemann's (2008) globalization benefits CLD comes its embellishment with Giddens' concerns. The brief overview of the SD modeling method along with model analysis follows. Then the article proceeds with the description of the SD modeling example and a brief discussion of the simulation and model analysis results.

Globalization benefits

Building on arguments by Friedman (2000) and Held *et al*. (1999), Lane and Husemann (2008) focus on those reinforcing feedback loops that might account for the perceived benefits of globalization. Adapted from Lane and Husemann, on the left middle of Fig. 1, goods and services innovation creates competitive pressures on old goods and services, thereby resources get freed from old goods and services and become available for innovation. In time, these freed, available resources might lead to further goods and services innovation (reinforcing feedback loop R1, Fig. 1).

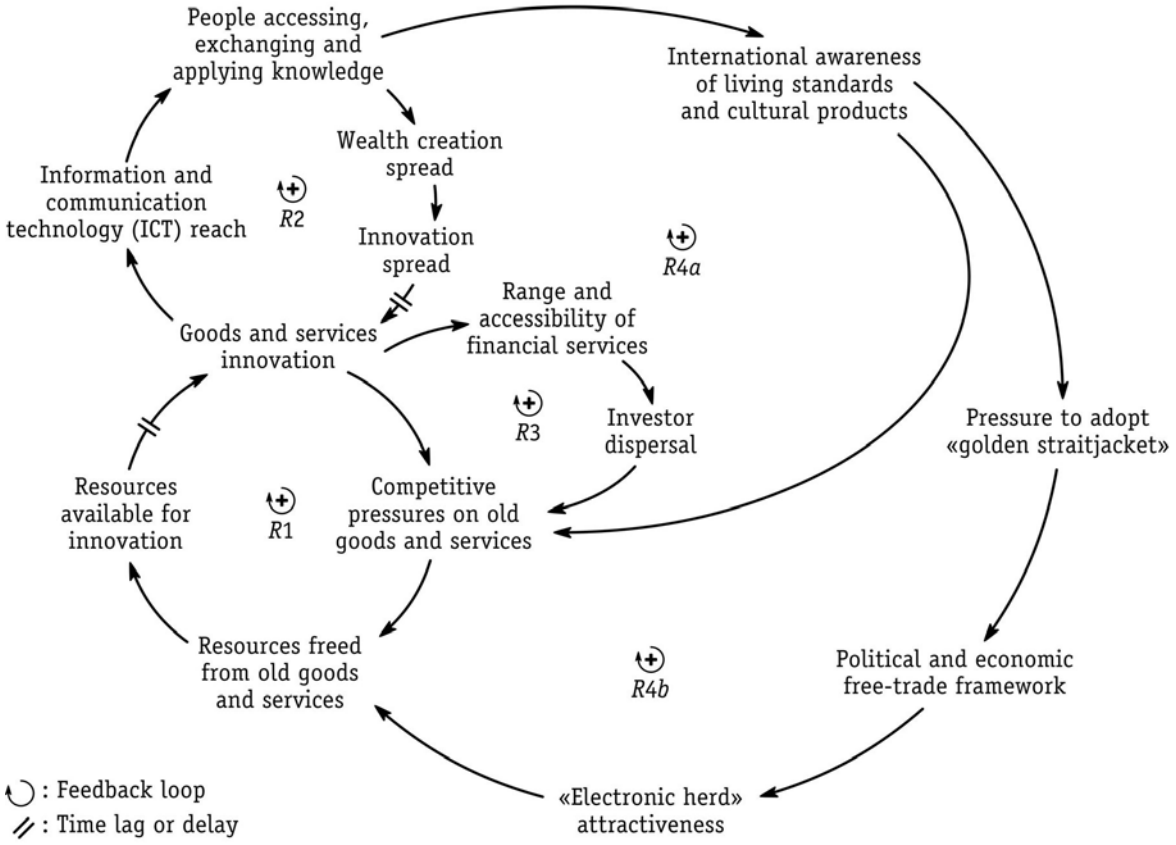

Figure 1 Adapted from Lane and Husemann (2008, p. 47), their CLD shows how reinforcing, i.e., positive '+', feedback loops contribute to globalization benefits; all arrow link polarities are '+' too.

Moreover, goods and services innovation allows expanding ICT reach and thereby enables more people to access, to exchange and to apply knowledge, which they can use to spread wealth creation and innovation geographically, in time leading again to further goods and services innovation (reinforcing feedback loop R2, Fig. 1). Last but not least, goods and services

innovation might also improve both the range and the accessibility of financial services, thereby causing a wider investor spread geographically to further reinforce competitive pressures on old goods and services (R3, Fig. 1).

Geographically spreading knowledge implies an increased international awareness of living standards and cultural products, once more creating competitive pressures on old goods and services (loop R4a, Fig. 1). But the international awareness of living standards and cultural products might pressure nation states to adopt a *golden straitjacket* and thereby reinforce installed components of the political and economic free-trade framework. This might in turn increase *electronic herd* attractiveness, whereby global investors add financial resources to those freed from old goods and services (R4b).

Lane and Husemann (2008) do provide some criticism about the reinforcing processes described above. Transnational corporations can, for example, create competition among countries. As transnational corporation (TC) power grows with an increasingly large influence on the world economy, individual citizens may lose their sense of influence on shaping the political agenda. Giddens is relevant here, because he writes about how globalization influences our individual quality of life. An important relation that Lane and Husemann leave out is the one between people's quality of life and the number of people who use and exchange knowledge so that they can elevate the level of their quality of life.

Gidden's globalization

Giddens sees globalization as the motor of development that brings varied changes, which shape modern societies. It is a process that contains varied, often opposing, tendencies. But we cannot criticize globalization completely. Neither can we stop it. Yet we cannot ignore its potentially negative effects, such as the growth of social unevenness, ecological and financial risk (global risk society). As critics of globalizations show, different effects persist among different societies in the world, even within one society.

According to Giddens, globalization affects societies, firms and the personal lives of people. The result is a hierarchical system of three distinct levels (left panel, Fig. 2). Individual citizens (people) affect transnational corporations or local firms and their respective industry value chains. And people are also members of the global society where TCs grow, in turn influencing individual people's quality of life through time. In order to meet their objectives,

transnational firms also form global industry value chains, which influence our global society both in the short and in the long term, i.e., with time lags or delays.

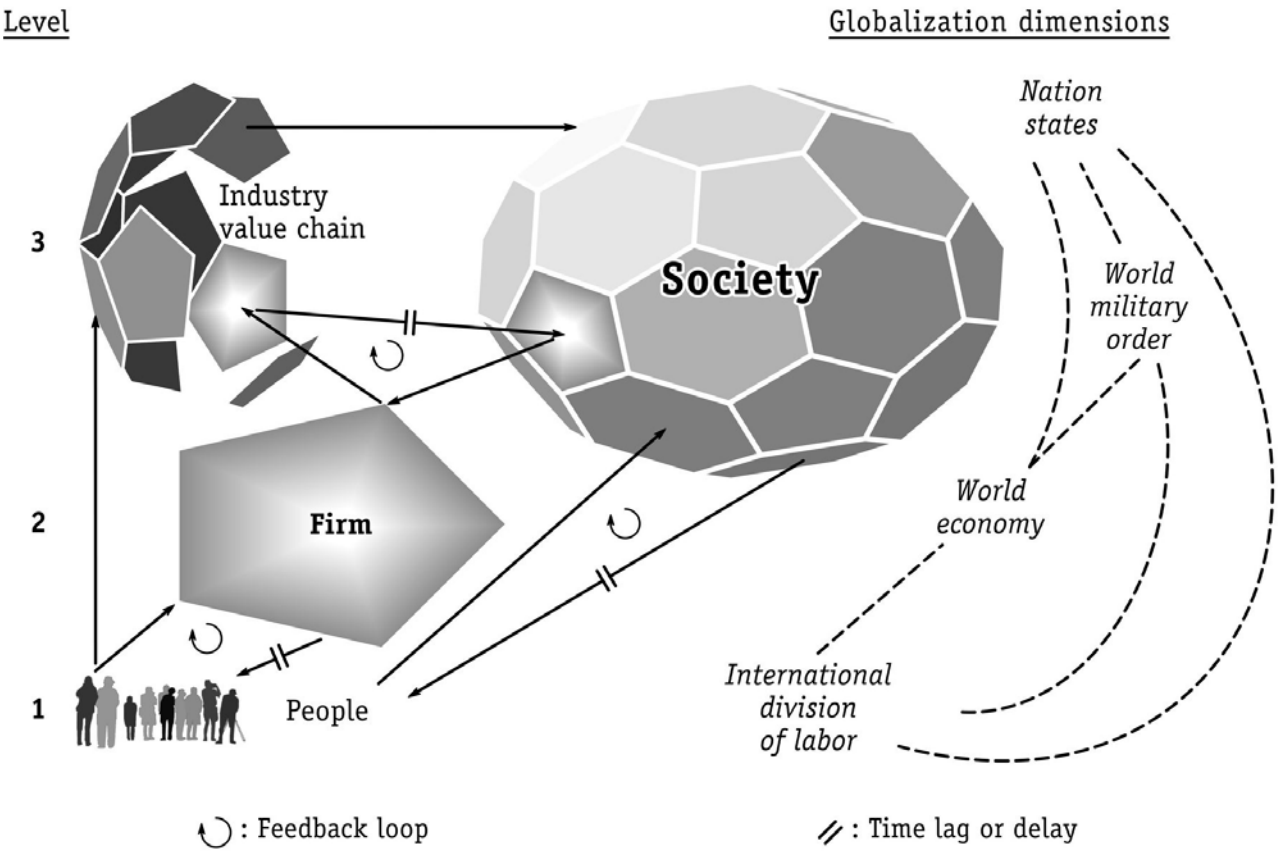

Figure 2 Juxtaposed next to Giddens' highly interconnected globalization dimensions (right panel), people, the firm, either a local or a transnational corporation (TC), and its respective industry value chain, along with the human society form a hierarchical system (left panel).

Giddens also talks about four highly interrelated globalization dimensions**:** nation states, world military order, world economy and international division of labor (right panel, Fig. 2). The world military order notwithstanding, we consider the nation-state system, the international division of labor and the world economy, the latter expressed through transnational corporation growth and outsourcing. The result is the CLD on Fig. 3, which extends the CLD on Fig. 1. Broadening our thinking, at least from the point of view of sociology, Fig. 3 reflects the individualistic perspective and thereby incorporates individual people's quality of life aspects. It shows the improvement of individual citizens' sustainable quality of life as an overarching progress objective.

Goods and services innovation improves people's quality of life. At the same time, ICT growth strengthens civil society through citizen participation, which also tends to improve people's quality of life. As Giddens notes:

> In addition to the powerful influences of the global marketplace and new communications technology, there is a groundswell of 'globalization from below', involving many million of people as well as organized groups of all kinds. An infrastructure of global civil society is being built by these changes. It can be indexed by the growing number of non-governmental organizations. In 1950 there were only two or three hundred. Now there are more than 10,000 and the trend is still sharply upwards (Giddens 2000, p. 123).

Giddens sees in globalization the birth of new individualism, change in the range of professional work, i.e., more people arrange their professional career than before, acquire new qualifications and skills and transfer them in a different professional context. So we can at least find in Giddens' globalization confirmation for feedback loops R2, R4a, R4b and R5 (Fig. 3). Yet the development of information and communication technology (ICT) causes the digitalization of world finances, pushing free markets on the level of virtuality. Giddens often refers to the well-known Y2K computer failure threat. Thankfully, the catastrophe did not come, but the global society was seriously alarmed. The threat still exists, however, because a lot more of our financial transactions depend on ICT.

Another matter that Giddens (1990) talks about is the global risk of social disorientation, which affects the citizens of the world, and the ecological risk, connected with the threat of health risk. These risks reduce people's quality of life (Fig. 3).

Globalization, through TC growth, outsourcing and the international division of labor leads to social unevenness. Enabled by transportation technologies and ICT employment grows in nation states where jobs go and temporal or short-term unemployment grows in nation states where jobs are outsourced. This short-term unemployment reduces people's quality of life. Giddens says that:

> There has undoubtedly taken place a major expansion of global interdependence in the division of labor since the Second World War. This has helped to bring about shifts in the worldwide distribution of production, including the deindustrialization of some regions in the developed countries and the emergence of the Newly Industrializing Countries in the Third World (Giddens 1990, p. 76).

Giddens notes that the transfer of industry to developing nation sates causes the steep decline in the number of those working in manufacture in the EU. But this is not the main reason for unemployment in the EU because we also see the impact of technological change, "which in many industries has either reduced the need for human labor power or has simply rendered more traditional production processes obsolete" (Giddens 2007, p. 7). Although Giddens sees outsourcing as a problem, it "should allow companies to reduce prices, helping consumers and also generating revenue for further investment. Lower prices should renew demand, in turn creating new employment" (Giddens 2007, p. 50). But here is a major EU challenge:

> The intensity of technological change, conjoined this and more globalized division of labor, creates new vulnerabilities for some groups. Young men with just qualifications, race mentioned, are likely to fare especially poorly. Older workers in manufacture, whose jobs disappear, risk long spells of unemployment, or the prospect of never working again, unless appropriate policy interventions are made" (Giddens 2007, p. 68).

So, the effect of differentiation on individual life leads to weakness of accessibility to new knowledge, turning the reinforcing feedback loop R5 on Fig. 3 from a virtuous circle that produces nothing but good to a vicious circle with very negative effects. As Lane and Husemann (2008, p. 49) see it, when one looks for globalization prospects, then all of the reinforcing loops are virtuous circles, producing nothing but good results. But when one seeks to unearth globalization problems, then all of the reinforcing loops may turn into vicious circles, producing nothing but negative results.

Giddens notices that transnational corporation growth reduces the strength of nation states. This is the cause of deeper social unevenness (risk). According to Giddens (1990), the process of globalization, especially worldwide markets, influence nation states to such an extent that the latter can hardly manage their economies. Growth of public discontent with politicians is just one outcome of this.

Nations are fiction says Keniche Ohmae, a Japanese author (*cf* Giddens 2002). But Giddens backs transformation. He claims that the nation-state system weakness causes the growth of the world economy but, despite all, nation states still hold on to essential powers via administering military strength, shaping the directions of political development and ruling social services. Nation states have control over territory and TCs do not (Giddens and Pierson 1998). So Giddens disputes the relative strength of the great transnational corporation (Giddens and Pierson 1989), arguing that nation states have more strength than TCs do and this will be so in

the future. However, the nation state becomes weaker because of TC growth, which in turn reduces the positive nation state influence on individual human life (Fig. 3).

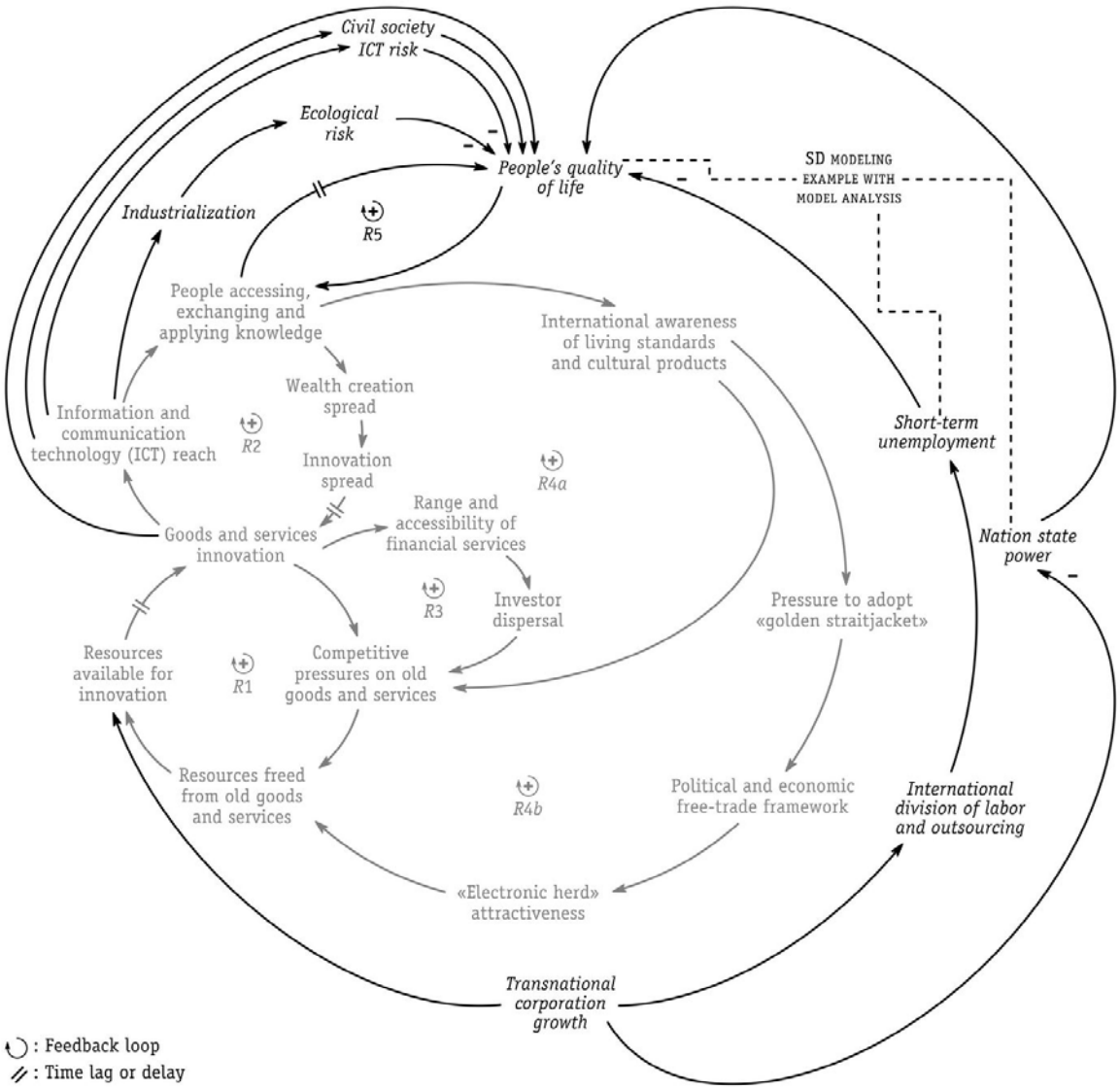

Figure 3 Extending the globalization benefits CLD (Fig. 1) with some of Giddens' concerns and his highly interwoven globalization dimensions; as a CLD convention, positive '+' link polarities bear no sign.

As Giddens notes:

> The turnover of the biggest multinational companies might be bigger than the GDP of most states, but nation states are still generically much more powerful. The reasons are that they control territory, whereas corporations don't; they can legitimately wield military force, whether individually or collectively; and they are responsible, again either individually or on a collective level, for sustaining an apparatus of law (Giddens 2000, p. 122).

He also says:

> If nation-states are the principal *actors* within the global political order, corporations are the dominant agents within the world economy. In their trading relations with one another, and with states and consumers, companies … depend upon production for profit. Hence the spread of their influence brings in its train a global extension of commodity markets, including money markets. However, even in its beginnings, the capitalist world economy was never just a market for the trading of goods and services. It involved, and involves today, the commoditifying of labor power in class relations, which separate workers from control of their means of production. This process, of course, is fraught with implications for global inequalities (Giddens 1990, pp. 71-72).

As a response to the weaknesses of the globalization process, Giddens (2000) proposes an entire system of social services, a state of social investments, the management of risk, equality, protection of the weak and freedom as autonomy, the active civil society, the democratizing of democracy (a decentralization process) as well as the principle of subsidy and positive social protections. Giddens proposes also financial market controls, stabilization of excessive movements of currencies, separating the short-term speculation from investing, and producing larger responsibility for TCs to manage the world economy. Giddens writes:

> There are five basics areas where global institutions need to be strengthened or further developed: the governance of the world economy, global ecological management, the regulation of corporate power, the control of warfare and the fostering of transnational democracy (Giddens 2000, p. 124).

Capturing some of Giddens' concerns, Fig. 3 shows that through TC growth globalization drives outsourcing as both transnational and local firms seek to reduce their production cost through 'labor arbitrage'. This creates temporal or short-term unemployment in nation states with firms that outsource jobs. While stirring away from "the ad hoc mixture of neo-liberal and conventional social-democratic recipes" (Mouzelis 2001, p. 436), Giddens (2000) still calls for unemployment aid. But, as the SD modeling example results show below, this could lead to long-term negative unintended consequences, such as, for example, "potentially starting a 'race to the bottom' for discretionary welfare" (Zagonel *et al*. 2004, p. 891).

In particular, quality of life, quantified below as an employment ratio, increases temporarily with welfare, but degrades in the long term, following a typical overshoot-and-collapse dynamics through time. The small SD modeling example below shows that the dynamic

complexity of globalization warrants simulation modeling in order to understand its behavior and to design policies that might avoid negative unintended consequences. Indeed, a substantial amount of modeling might be needed to gain a comprehensive understanding of globalization's dynamic consequences or implications.

A system dynamics (SD) simulation modeling example

The SD modeling method: an overview

The SD modeling process aims at helping managers, researchers and policy makers articulate exactly how the structure of circular feedback relations among variables in the system they manage determines its performance through time (Forrester and Senge 1980). In its endless hunt for superior performance, which only *systemic leverage* endows (Georgantzas and Ritchie-Dunham 2003), SD's basic tenet is that the structure of feedback loop relations in a system gives rise to its dynamics (Meadows 1989, Sterman 2000, p. 16).

SD moves beyond systems thinking (Gharajedaghi 1999, Senge *et al*. 1994) to formal systems modeling. Pioneered by MIT's Forrester (1958, 1961) and influenced by engineering control theory, SD calls for formal simulation modeling that provides a rigorous understanding of system behavior. Simulation modeling is an essential tool because "people's intuitive predictions about the dynamics of complex systems are systematically flawed" (Sterman 1994, p. 178), mostly because of our bounded rationality. Davis, Eisenhardt and Bingham (2007) and Fontana (2006) see SD as a modeling method, with high descriptive ability and theory building potential.

Two types of diagrams help formalize system structure**:** causal loop diagrams (CLDs) and stock and flow diagrams. A CLD depicts relations among variables (e.g., Fig. 1, left panel on Fig. 2, and Fig. 3). Arrow links show the direction of causality and '+' and '–' signs the polarity of relations, i.e., how an increase in a variable affects change in a related variable. The culmination of all variable relations describes a set of positive or reinforcing and negative or balancing feedback loops characterizing a system.

Complementary to CLDs (Sterman, 2000), stock and flow diagrams depict how flow variables accumulate into stock variables, i.e., how stocks integrate the flows and how the flows differentiate the stocks (e.g., Fig. 6). Stock and flow diagrams also include causal loops, and provide the system with useful features such as memory and inertia. So they are essential in

determining the dynamic behavior of the system under study. At the right level of abstraction, SD researchers encounter similar causal processes that underlie seemingly highly diverse phenomena (Forrester, 1961).

Model analysis in the SD modeling method

SD formally links system structure and performance. In order to help academics, managers and policy makers see exactly what part of system structure affects its performance through time, i.e., detect shifting loop polarity and dominance (Richardson, 1995), SD researchers use tools from discrete mathematics and graph theory first to simplify and then to automate model analysis (Gonçalves Lerpattarapong and Hines 2000, Kampmann 1996, Mojtahedzadeh 1996, Mojtahedzadeh *et al*. 2004, Oliva 2004, Oliva and Mojtahedzadeh 2004). Mostly, they build on Nathan Forrester's (1983) idea to link feedback loop strength to system eigenvalues.

The PPM plays a crucial role in the analysis of this article's model. It detects and displays prominent causal paths and loop structures by computing each selected variable's dynamics from its slope and curvature, i.e., its first and second time derivatives. Mojtahedzadeh *et al*. (2004) give an extensive overview of PPM that shows its conceptual underpinnings and mathematical definition, exactly how it relates to system eigenvalues, and concrete examples to illustrate its merits. Using a recursive heuristic approach, PPM detects compact structures of chief causal paths and loops that contribute the most to the performance of a selected variable through time. It first slices a selected variable's time path or trajectory into discrete phases, each corresponding to one of eight possible behavior patterns through time (Fig. 4). Once the selected variable's time trajectory is cut into phases, PPM decides which pathway is most prominent in generating that variable's performance within each phase. As causal paths combine to form loops, combinations of such circular paths shape the most influential or prominent loops within each phase.

Indeed, tools such as PPM can help make sense of the dynamically complex structure of SD models, even if Oliva (2004, p. 331) finds SD keen in understanding system performance, "not structure per se", in lieu of its core tenet that system structure causes performance. Methodologically, this article contributes to the stream of SD research on PPM applications and value (Mojtahedzadeh *et al*. 2004, Oliva and Mojtahedzadeh 2004).

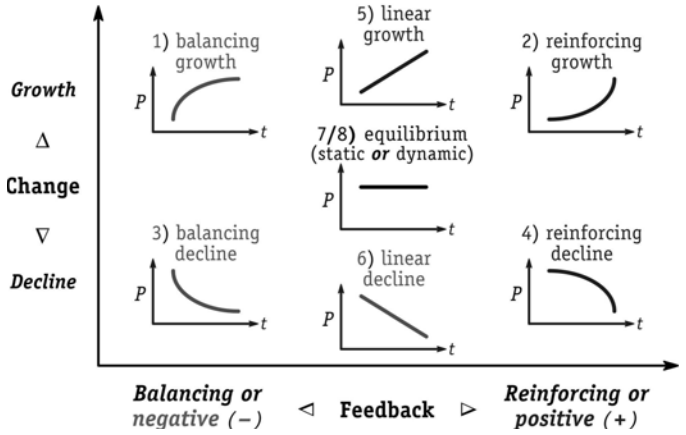

Figure 4 Eight archetypal performance (P) dynamics, i.e., behavior patterns through time, might exist within a single phase of behavior for a single variable (*adapted* from Mojtahedzadeh *et al*. 2004).

Model description

Imagine how people's quality of life might evolve relative to employment in a developing nation state such as, for example, Djibouti in Eastern Africa, bordering the Gulf of Aden and the Red Sea, between Eritrea and Somalia. The subsystem diagram of Fig. 5 shows the SD example model's two sectors, dynamically interconnected through bundled information connectors and bundled flows. Even small, bite-size SD modeling examples such as this do show the interdependencies among variables connected through multiple feedback loops.

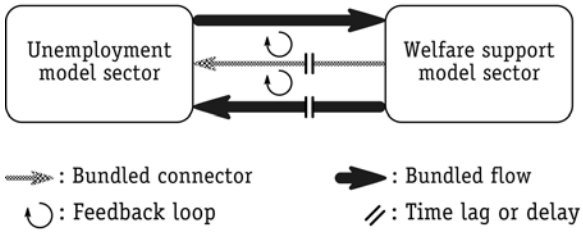

Figure 5 Subsystem diagram of the SD simulation-modeling example

There is a one-to-one correspondence between the actual model diagram on Fig. 6 and its equations (Table 1 and Table 2). Building the model entailed first drawing the model structure on the glass of a computer screen and then specifying simple algebraic equations and parameter values. The *iThink® Software* (Richmond *et al*. 2009) enforces consistency between diagram and equations, while its built-in functions help quantify parameters and variables pertinent to the effects of unemployment, i.e., Jobless People, on people's quality of life in Djibouti.

In SD, rectangles represent stocks or level variables that can accumulate, such as the Jobless People stock on Fig. 6. Emanating from cloud-like *sources* and ebbing into cloud-like *sinks*, the double-line, pipe-and-valve-like icons that fill and drain the stocks represent flows or rate variables that cause the stocks to change. The 'obtain work' flow on Fig. 6, for example, at once feeds the Working People stock and also drains the Jobless People stock, modulated by the Jobless People level and the time it takes unemployed people to obtain work. Single-line arrows represent information connectors, while circular or plain text icons depict auxiliary converters where behavioral relations, constants or decision points convert information into decisions. People's quality of life (top left, Fig. 6), for example, depends on both the Jobless People (Eq. 1, Table 1) and the Working People (Eq. 10, Table 2) stocks.

On Fig. 6, time to obtain work (Eq. 9, Table 1), which determines the time it takes unemployed people to obtain work (Eq. 4), is a upward sloping function of welfare load (Eq. 8), relative to Jobless People and Djibouti's welfare capacity (Eq. 7). In addition to providing employment (Working People, Eq. 10) to Djibouti's labor, most kindly, per Gidden's advice, international aid supports 50 percent of Djibouti's employment capacity given as welfare aid.

Once employed, Working People get free training in order to learn new skills. Within 12 months (Eq. 14, Table 2), some of them move abroad (Eq. 12), perhaps to where TCs need them within a global value chain or simply to take advantage of their newly acquired skills. Some of them lose their job (Eq. 3) and return to being Jobless People, to whom Djibouti provides welfare. The *graphical table function* (gtf) of work loss probability (top right, Fig. 6 and Eq. 18) not only explicitly depends on the welfare support load (Eq. 17), but also abides to the cumulative normal curve requirements (Franco 2007, Wilk and Gnanadesikan 1968).

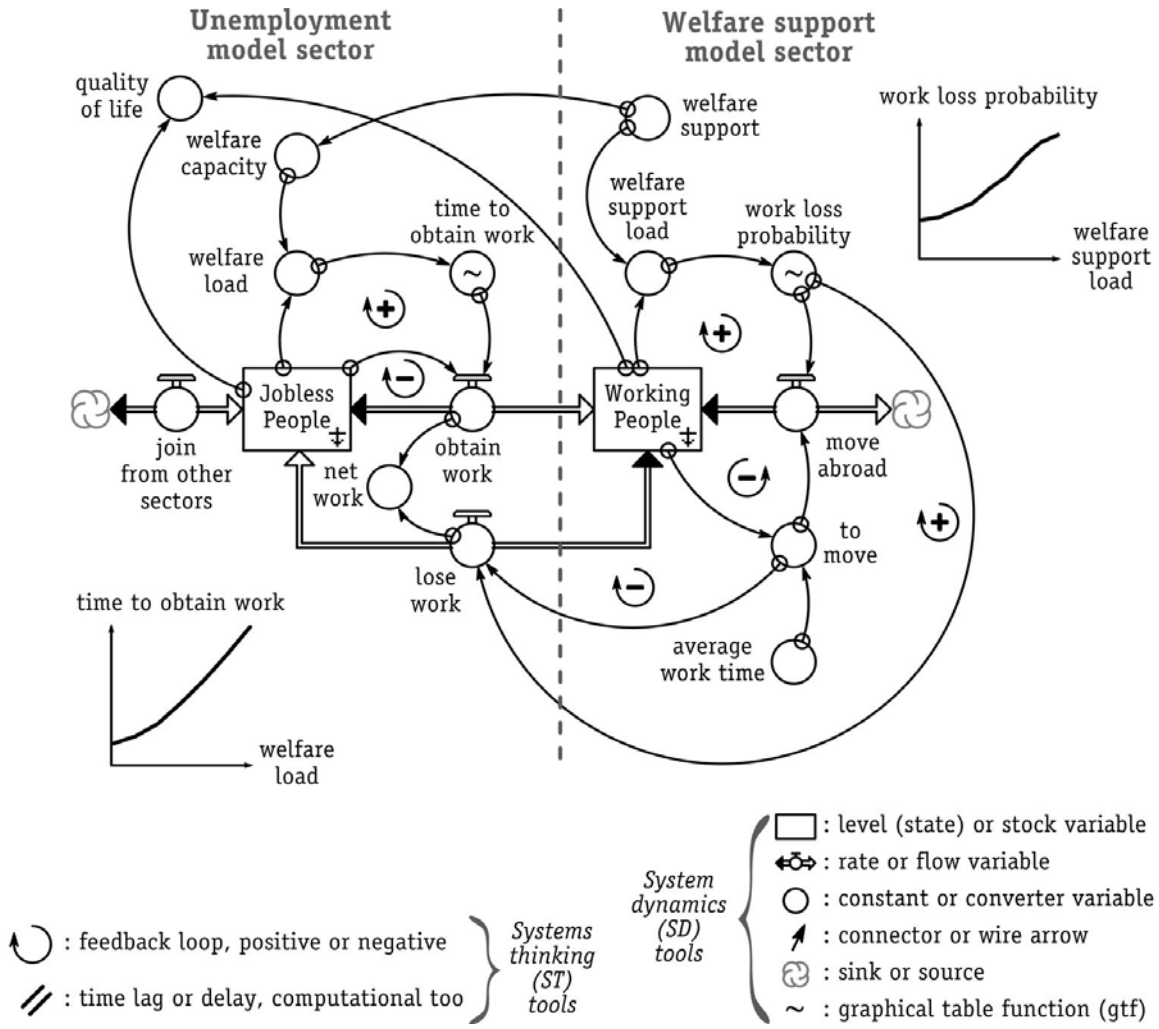

Figure 6 Stock and flow diagram of the SD simulation-modeling example showing unemployment (i.e., Jobless People) in a nation state with welfare support.

Initialized at steady state to avoid possible computational artifacts, the Jobless People and Working People stocks are caught in several feedback loops, each exerting its own influence on Djibouti's employed and unemployed population. Namely Jobless People are caught in a total of six feedback loops, while Working People are caught in a total of eight loops.

Six of the feedback loops are clearly marked on Fig. 6, three of them balancing or negative '–' and three of them reinforcing or positive '+'. Some of the loops are nested, i.e., a loop within a loop, and other combine to form larger loops. So even a small, bite-size SD model such as this can show enough dynamic complexity to warrant computer simulation.

Table 1 Unemployment model sector equations

Level (state) or stock variables {unit}	*Eq. #*
Jobless People(t) = Jobless People(t - dt) + (join from other sectors + lose work - obtain work) * dt	(1)
INIT Jobless People = 0.5 * welfare support {people}	(1.1)
Flow or rate variables {unit}	
join from other sectors = 1000 {people / month}	(2)
lose work = to move * work loss probability {people/month}	(3)
obtain work = Jobless People/time to obtain work {people / month}	(4)
Auxiliary or converter variables and constants {unit}	
net work = obtain work - lose work {people / month}	(5)
quality of life = Working People / (Working People + Jobless People) {unitless}	(6)
welfare capacity = 0.5 * welfare support * (1 + STEP (0.2, 6)) {unit: people}	(7)
welfare load = Jobless People / welfare capacity {unitless}	(8)
time to obtain work = GRAPH (welfare load {month})	(9)
(0.6, 3.00), (0.8, 4.00), (1.00, 6.00), (1.20, 9.00), (1.40, 12.2), (1.60, 15.9), (1.80, 20.0)	

Table 2 Welfare support (transnational corporation) model sector equations

Level (state) or stock variables {unit}	*Eq. #*
Working People(t) = Working People(t - dt) + (obtain work - move abroad - lose work) * dt	(10)
INIT Working People = welfare support {people}	(10.1)
Flow or rate variables {unit}	
lose work = to move * work loss probability {people/month}	(11)
move abroad = to move * (1 - work loss probability) {people / month}	(12)
obtain work = Jobless People/time to obtain work {people / month}	(13)
Auxiliary or converter variables and constants {unit}	
average work time = 12 {month}	(14)
to move = Working People / average work time {people / month}	(15)
welfare support = 24000 {people}	(16)
welfare support load = Working People / welfare support {unitless}	(17)
work loss probability = GRAPH (welfare support load {unitless})	(18)
(0.6, 0.27), (0.7, 0.3), (0.8, 0.34), (0.9, 0.41), (1, 0.5), (1.10, 0.6), (1.20, 0.74), (1.30, 0.85), (1.40, 0.9)	

Simulation and SD model analysis results

Figure 7 shows the SD modeling example computational results, focusing on the effects of employment (Working People) and unemployment (Jobless People) on their quality of life. Until t = 6 months, the model runs at steady state, assuming that Djibouti has reached a point equilibrium of happy stability (Fig. 7a), clearly marked as *equilibrium point attractor* 1 (one) on the phase plot of Fig 7b. Phase plots hide the time dimension, but the little arrows on Fig. 7b help to show how the relation between people's net work and quality of life evolves through time.

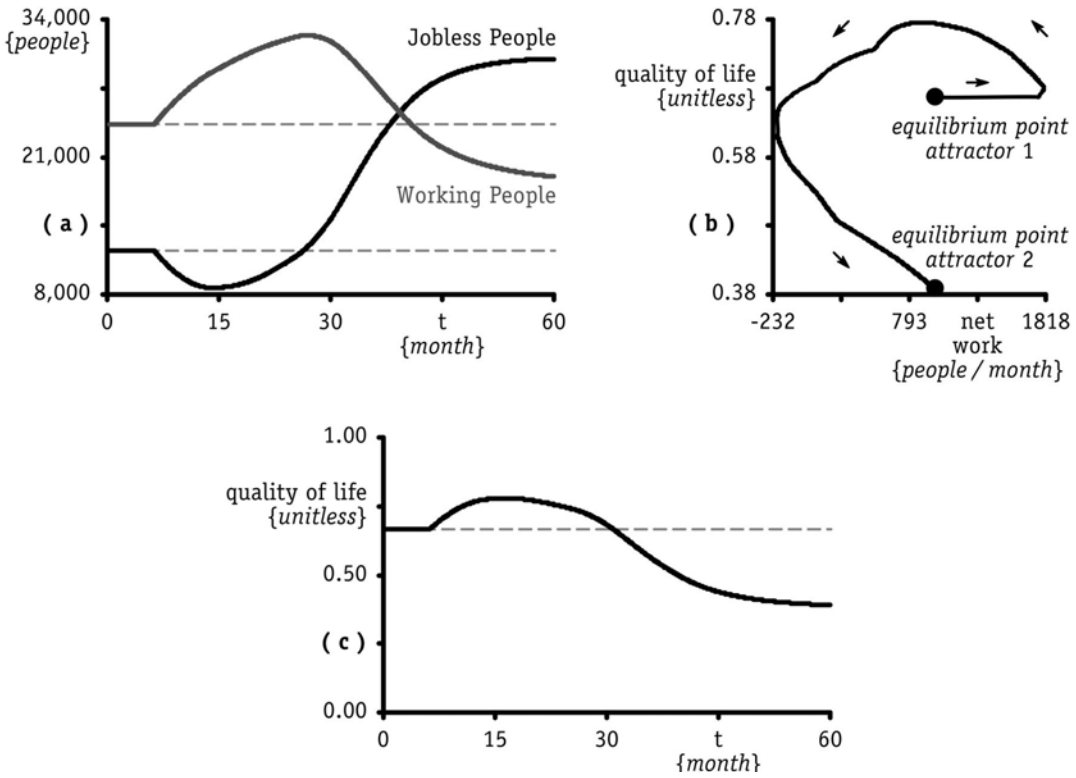

Figure 7 Experimental results computed through a five-year period (60 months)

According to the PPM, the most prominent feedback loops at this initial steady state that account for the employment, i.e., Working People, dynamics are loops #1 and #2 (Fig. 8a). Then at time t = 6 months, following Giddens' advise, after a long negotiation perhaps, Djibouti increases its welfare support by 20 percent (Eq. 7). *Ceteris paribus*, Giddens' advise works wonders for about nine months or until t = 13.72 months. Until then, the Jobless People level declines and the Working People stock increases (Fig. 7a). The latter stock continues to increase at a declining rate until t = 27.47 months.

People's quality of life, a function of the net work rate (Eq. 5), also increases, reaching a temporary equilibrium between t = 13.72 months and t = 18.25 months (Fig. 7c). So, for some time at least, Djibouti's politicians praise themselves, celebrating the increase in Djibouti's employment and the decline it its unemployment. Djibouti's citizens are very pleased. But then at time t = 13.72 months, the highly interconnected structure of feedback loop relations on Fig. 6 cause Djibouti's unemployed population to rise again, now at an increasing rate, while its Working People stock continues to rise at a declining rate (Fig. 7a and Fig. 8, top panel).

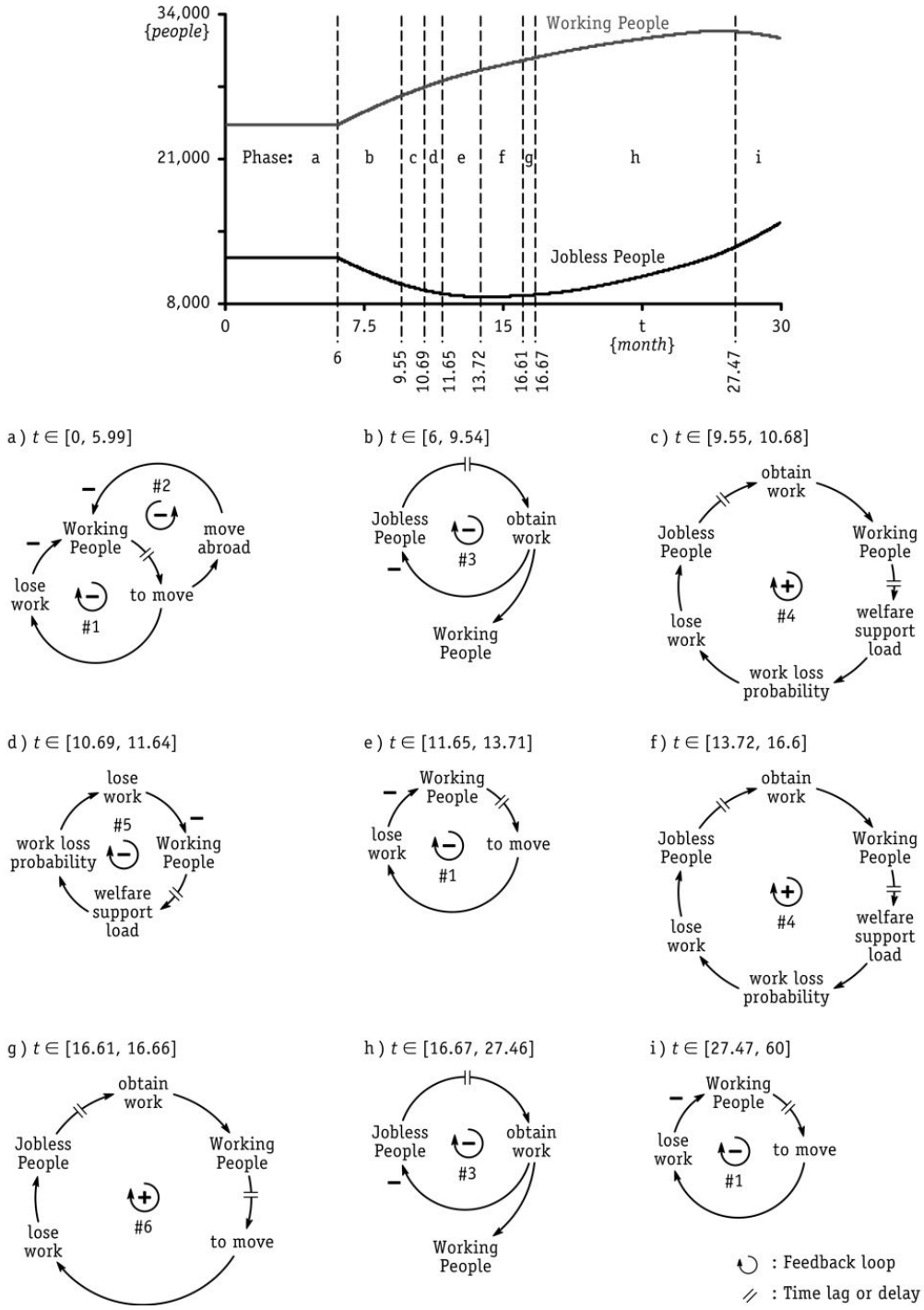

Figure 8 The PPM shows which causal paths are most prominent in generating the employment (Working People) dynamics through time. Prominent causal paths combine to form feedback loops and thereby shape the most influential or prominent loops within each time phase.

Namely the reinforcing or positive '+' feedback loop #4 becomes most prominent (Fig. 8f), causing both the Jobless People and the Working People stocks to increase. The two stocks

continue to grow in phase ‘g’, when the reinforcing or positive ‘+’ feedback loop #6 becomes most prominent (Fig. 8g). But then at time t = 16.67 the balancing or negative ‘–’ loop #3 takes over (Fig. 8h) and thereby modulates the two stocks’ growth.

And after t = 27.47 months until the end of the simulation (t = 60 months), the balancing or negative ‘–’ feedback loop #1 becomes the most prominent causal path again (Fig. 8h), so the Working People stock begins to decline too (Fig. 7a). Combined with the increase in Jobless People, the decline in Working People pushes down people’s quality of life (Fig. 6c).

Looking at the phase plot of Fig. 6b, it might be very difficult for globalization researchers to establish a clear statistical correlation between people’s net work and their quality of life (Byrne and Strobl 2004, Glewwe 1987). Back to the time domain (Fig. 7c). By time t = 27.47 months, people’s quality of life has come down to its initial level and continues to decline thereafter, until by time t = 60 months it reaches its new *equilibrium point attractor* 2 (Fig. 7b), located 28 percentage points below its initial equilibrium level.

It is fascinating how powerful the prominent causal path of the balancing or negative ‘–’ feedback loop #1 is (Fig. 6 and Fig. 8). It dominates the system for more than half of the simulation time, causing all three metrics on Fig. 7 to follow the balancing growth and decline dynamics on Fig. 4 (archetypal performance patterns #1 and #3, respectively).

Discussion and conclusion

By definition, globalization is a dynamic process. Any model that purports to explain the evolution of a dynamic process also defines a dynamic system either explicitly or implicitly (Repenning, 2002). A crucial model-building aspect in any domain is that any claim a model makes about the nature and structure of relations among variables in a system must follow as a logical consequence of its assumptions about the system. And attaining logical consistency requires checking if the dynamic system the model defines can generate the life-like performance of the dynamic process that the model tries to explain.

Albeit artificial, the experimental behavior of the SD modeling example above might resemble dynamics beyond the unemployment effects on people’s quality of life. For example, industry overshoot and collapse dynamics have been observed in e-commerce early in this century, when a large number of Internet firms entered the industry and then went out of business (Oliva, Sterman and Giese, 2003) and in IT industries as a result of disruptive

innovation (Georgantzas and Katsamakas 2007, 2008). The SD modeling method and tools described here can be extended and used equally well in diverse contexts and that should be a fruitful direction for future research in Giddens' globalization.

In their fully-fledged SD model of resource clusters for employment services, Andersen *et al*. (2003) and Zagonel *et al*. (2004) show similar results to those of Fig. 6. They label the phenomenon of the increased dependence of jobless people on welfare 'recidivism' and conclude that welfare policies at the 'edges' of the system might provide the highest leverage to cut back on *recidivism*. Yet, such self-sufficiency programs and system-*edge* policies require complex, community-wide partnerships in order to implement them.

Purely deterministic, this article's SD modeling example is rather useful in explaining employment dynamics. With six different feedback loops becoming prominent along nine distinct time phases, the article demonstrates the indispensable role of SD modeling in explaining the dynamic implications of Giddens' globalization.

The pathway participation metric (PPM), with its analysis of shifting prominent structure and polarity phases, helped reveal the model analysis results. Model analysis tools such as PPM help articulate structural complexity and thereby enable both effective and efficient policy and strategy designs (Georgantzas and Ritchie-Dunham 2003).

Complexity theory and the exponential increase in computational power make simulation a critical fifth tool in addition to the four tools used in science for theory building: observation, logical/mathematical analysis, hypothesis testing and experiment (Davis *et al*. 2007, Turner 1997). Simulation modeling with system dynamics might permit globalization researchers and practitioners to examine the aggregate, dynamic and emergent implications of the multiple, nonlinear, generative mechanisms embedded in the processes capabilities and resources of every modern nation state and organization (Oliva and Sterman 2001, Repenning and Sterman 2002). In terms of future research, enriching Giddens' globalization with his own 'structuration theory' (Giddens 1983, 1984), a general theory of social organization, might lead to better understanding the globalization process, with all its potential prospects and problems.

References

Alfeld LE and Graham A. 1976. *Introduction to Urban Dynamics*. MIT Press, Cambridge MA; reprinted by Productivity Press: Portland OR and currently available form Pegasus Communications: Waltham MA.

Andersen DF, Rohrbaugh JW, Richardson GP, Lee TP and Zagonel AS. 2003. Using group model-building to support public policy development. In *Proceedings of the 5th Annual Conference of the UK Chapter of the System Dynamics Society* (Feb. 6-7): Harrogate, UK.

Anderson JC, Rungtusanatham M and Schroeder RG. 1994. A theory of quality management underlying the Deming management method. *Academy of Management Review* **19**(3, *Total Quality Special Issue*): 472-509.

Byrne D and Strobl E. 2004. Defining unemployment in developing countries: evidence from Trinidad and Tobago. *Journal of Development Economics* **73**(1): 465-476.

Davis JP, Eisenhardt KM and Bingham C. 2007. Developing theory through simulation methods. *Academy of Management Review* **32**(2): 480–499.

Fontana M. 2006. Simulation in economics: evidence on diffusion and communication. *Journal of Artificial Societies and Social Simulation* **9**(2): http://jasss.soc.surrey.ac.uk/9/2/8.html.

Forrester JW. 1958. Industrial dynamics: A major breakthrough for decision makers. *Harvard Business Review* **36**(4): 37-66.

Forrester JW. 1961. *Industrial Dynamics*. MIT Press: Cambridge, MA; currently available from Pegasus Communications: Waltham, MA.

Forrester JW and Senge PM. 1980. Tests for building confidence in system dynamics models. In AA Legasto Jr, JW Forrester and JM Lyneis (Eds), *TIMS Studies in the Management Sciences, Vol.* 14*: System Dynamics*. North-Holland: New York NY, pp. 209-228.

Forrester, N. (1983). Eigenvalue analysis of dominant feedback loops. In *Plenary Session Papers Proceedings of the* 1*st International System Dynamics Society Conference*, Paris, France: 178-202.

Franco D. 2007. Fifty years of table functions. In *Proceedings of the* 25*th International Conference of the System Dynamics Society and* 50*th Anniversary Celebration*, Jul. 29 – Aug. 2, Boston, MA.

Friedman T. 2000. *The Lexus and the Olive Tree*. HarperCollins: London, UK.

Georgantzas NC and Katsamakas EG. 2007. Disruptive innovation strategy effects on hard-disk (HD) maker population: a system dynamics study. *Information Resources Management Journal* **20**(2): 90-107.

Georgantzas NC and Katsamakas EG. 2008. Information technology industry dynamics: impact of disruptive innovation strategy. In M. Khosrow-Pour (Ed.), *Best Practices and Conceptual Innovations in Information Resources Management: Utilizing Technologies to Enable Global Progressions*. Hershey, PA: IGI Global, pp. 231-250.

Georgantzas NC and Ritchie-Dunham JL. 2003. Designing high-leverage strategies and tactics. *Human Systems Management* **22**(1): 217-227.

Gharajedaghi J. 1999. *Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture*. Butterworth-Heinemann: Boston MA.

Giddens A. 1983. Comments on the theory of structuration. *Journal for the Theory of Social Behavior* **13**(1): 75-80.

Giddens A. 1984. *The Constitution of Society*. Polity Press: Cambridge, UK.

Giddens A. 1990. *The Consequences of Modernity*. Stanford University Press: Stanford, CT.

Giddens A. 2000. *The Third Way and its Critics*. Polity Press: Cambridge, UK.

Giddens A. 2002. *Runaway World. How globalization is reshaping our lives*. Profile Books: London, UK.

Giddens A. 2006. *Sociology*. Polity Press: Cambridge, UK.

Giddens A. 2007. *Europe in the Global Age*. Polity Press: Cambridge, UK.

Giddens A and Hutton W (Eds). 2001. *On the edge: Living with Global Capitalism*. Vintage: London, UK.

Giddens A and Pierson C. 1989. *Conversations with Anthony Giddens*. Polity Press: Cambridge, UK.

Giddens A and Pierson C. 1998. *Making Sense of Modernity*. Stanford University Press: Stanford, CT.

Glewwe P. 1987. Unemployment in developing countries: economist's models in light of evidence from Sri Lanka. *International Economic Journal* **1**(4): 1-17.

Gonçalves P, Lerpattarapong C and Hines JH. 2000. Implementing formal model analysis. In *Proceedings of the* 18*th International System Dynamics Society Conference*, August 6-10, Bergen, Norway.
Held D, McGrew A, Goldblatt D and Perraton J. 1999. *Globalization*. Foreign Policy Center: London, UK.
Held D and Thompson JB 1989. *Social Theory of Modern Societies: Anthony Giddens and His Critics*. Cambridge University Press: Cambridge, UK.
Kampmann CE. 1996. Feedback loop gains and system behavior. In *Proceedings of the* 12*th International System Dynamics Society Conference*, July 21-25, Cambridge MA.
Lane DC and Husemann E. 2008. Steering without Circe: attending to reinforcing loops in social systems. *System Dynamics Review* **24**(1): 27-61.
Mojtahedzadeh MT. 1996. *A Path Taken: Computer-Assisted Heuristics for Understanding Dynamic Systems*. Ph.D. Dissertation. Rockefeller College of Public Affairs and Policy, SUNY: Albany NY.
Mojtahedzadeh MT, Andersen D and Richardson GP. 2004. Using Digest® to implement the pathway participation method for detecting influential system structure. *System Dynamics Review* **20**(1): 1-20.
Morecroft JDW. 1985. Rationality in the analysis of behavioral simulation models. *Management Science* **31**: 900-916.
Mouzelis N. 2001. Reflexive modernization and the third way: the impasses of Giddens' social-democratic politics. *Sociological Review* **49**(3): 436-456.
Oliva R. 2004. Model structure analysis through graph theory: partition heuristics and feedback structure decomposition. *System Dynamics Review* **20**(4): 313-336.
Oliva R and Mojtahedzadeh MT. 2004. Keep it simple: a dominance assessment of short feedback loops. In *Proceedings of the* 22*nd International System Dynamics Society Conference*, July 25-29, Keble College, Oxford University, Oxford UK.
Oliva R and Sterman JD. 2001. Cutting corners and working overtime: quality erosion in the service industry. *Management Science* **47**(7): 894-914.
Oliva R, Sterman JD and Giese M. 2003. Limits to growth in the new economy: exploring the 'get big fast' strategy in e-commerce. *System Dynamics Review* **19**(2): 83-117.
Paich M and Sterman JD. 1993. Boom, bust and failures to learn in experimental markets. *Management Science* **39**(12): 1439-1458.
Repenning NP. 2002. A simulation-based approach to understanding the dynamics of innovation implementation. *Organization Science* **13**(2), 109-127.
Repenning NP and Sterman JD. 2002. Capability traps and self-confirming attribution errors in the dynamics of process improvement. *Administrative Science Quarterly* **47**: 265-295.
Richardson GP. 1995. Loop polarity, loop prominence, and the concept of dominant polarity. *System Dynamics Review* **11**(1), 67-88.
Richmond B. 1993. Systems thinking: critical thinking skills for the 1990s and beyond. *System Dynamics Review* **9**(2): 113-133.
Richmond B *et al*. 2009. *iThink® Software (version* 9.1.2*)*. iSee Systems™: Lebanon NH.
Sastry MA. 1997. Problems and paradoxes in a model of punctuated organizational change. *Administrative Science Quarterly* **42**(2): 237-275.
Senge P *et al*. 1994. *The Fifth Discipline Fieldbook*. Currency-Doubleday: New York, NY.
Sterman JD. 1989. Modeling managerial behavior: misperceptions of feedback in a dynamic decision making experiment. *Management Science* **35**(3): 321-339.
Sterman JD. 2000. *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin McGraw-Hill: Boston, MA.
Turner F. 1997. Foreword: Chaos and social science. In RA Eve, S Horsfall and ME Lee (Eds). *Chaos, Complexity and Sociology*. Sage: Thousand Oaks, CA (pp. xi-xxvii).
Wilk MB and Gnanadesikan R. 1968. Probability plotting methods for the analysis of data. *Biometrika* **55**: 1-17.
Zagonel AA, Zagonel JC, Richardson GP and Andersen DF. 2004. Using simulation models to address 'what if' questions about welfare reform. *Journal of Policy Analysis and Management* **23**(4): 889-920.