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USAID, Simulated Futures, and the Politics of Postcolonial Expertise, 1964–1980

Kevin T. Baker

In early 1967, Nigeria was on the brink of civil war. The previous year had seen two military coups, widespread intercommunal violence, and a major crisis of confidence in Nigeria's federal system. With secessionist sentiments escalating in the Eastern Region, Glenn L. Johnson was undergoing his own crisis. He was the director of Michigan State University's Consortium for the Study of Nigerian Rural Development (CSNRD), a USAID-funded group of social scientists and other experts working on problems of rural development in Africa's largest country. This project, despite propitious beginnings, was on the verge of collapse. Already marred by a series of scandals in faraway Vietnam that damaged the group's credibility, the unrest in Nigeria made further data collection nearly impossible. With the future of the Consortium—and, indeed, the future of Nigeria—in doubt, Johnson began searching for ways to salvage the group's research project. Familiar with a farm management computer game being developed at Michigan State called Simfarm, he began exploring the possibility of creating a simulation model of the Nigerian economy from CSNRD data. As Nigeria collapsed into civil war, Johnson and a team of programmers, agricultural economists, and engineers endeavored to create a new version of that country, a Virtual Nigeria.

This chapter explores how Glenn Johnson and his colleagues at Michigan State University (MSU) sought not only to predict, but also shape Nigeria's future. In a time before oil revenues came to dominate economic life in the country, Johnson and his team were dedicated to modernizing Nigeria's dominant industry: agriculture. When conventional methods failed, they designed an interactive computer simulation called the Nigerian Agricultural Sector Simulation (NASS), which would enable its users to generate and select from competing agricultural policy futures for the country. Because much of the Nigerian documentation from this period is still closed to researchers, this chapter focuses on the story of the modelers, exploring how they sought to create credible knowledge about the future in a climate of postcolonial suspicion. Johnson and his colleagues worked during a period of transition, one in which American development experts no longer seemed credible and their visions of the future, embodied most famously

in the "modernization theory" of W. W. Rostow, no longer seemed appropriate or desirable to many leaders in the developing world. Consequently, MSU's simulation aimed not only at creating knowledge about Nigeria's potential futures, but it was consciously committed to producing credibility and trust in those futures.

Theodore Porter's *Trust in Numbers* has shown that the quantification of bureaucratic decision-making in the nineteenth and twentieth centuries was not primarily due to a desire to produce scientifically rigorous data.[1] Instead, Porter argues, quantification emerged because trust in elites had eroded in the face of a growing, democratizing society. "Trust in numbers" and notions of objectivity came to stand in for trust in people. This chapter asks what happens when numbers are no longer enough to produce trust. Instead of relying on objective numbers to produce trust, Johnson and his team brought subjectivity—the subjective experience of decision makers—to bear. With its interactive, responsive design, the Nigerian Agricultural Sector Simulation (NASS) involved the user directly in the research process, allowing a policy-maker to create multiple, experimental futures. By allowing a decision-maker to experiment and to bring their own experience to bear, Johnson and his team hoped their simulation could produce Nigerian futures that were credible and could be translated into actual policy. An exploration of the design of the NASS simulation suite offers important insights into the politics of trust in the postcolonial period. Similarly, this chapter argues that computer simulations like the NASS encouraged policy planners to imagine the future as a potential site of political intervention, choice, and even control.

After the decline of modernization theory's credibility after the Vietnam War, simulation approaches like Michigan State's NASS seemed for a time to be a useful way to repackage Washington's international development agenda. In a climate in which leaders in developing countries were beginning to view Western-oriented theories of modernization with great suspicion, NASS's designers incorporated a number of experiential and affective features into the simulation environment. These were intended to enhance the model's credibility among Nigerian officials. By allowing decision-makers to manipulate policy variables at will, the interactive nature of NASS gave officials the impression of total control, while the underlying assumptions of the economic model guided their actions and shaped their political intuition.

Modernization theory was a political vision that purported to provide "pre-modern" nations a path to Western-style, capitalist modernity. Unlike other, earlier theories of economic development, modernization theory denied the relevance of racial or geographic barriers to capitalist development. In the work of Rostow and his colleagues, some countries may be "ahead" of others in terms of economic "progress," but there were no intractable barriers that would prevent a nation like Nigeria from becoming an urbanized, industrial, and commercial society like the US.

Although the scholars at MIT's Center for International Studies were undoubtedly important architects of development policy in the Kennedy and Johnson administrations, a single-minded focus on modernization theorists in the historiography of international development homogenizes what was, in fact, an ideologically plural community of development workers. Daniel Immerwahr has argued that much of the US's international development work stressed not the large scale, urban, and industrial vision of Rostow and MIT's Center for International Studies, but instead devoted effort to small scale, rural, and community development.[2] Further, Helen Tilley's work on colonial development in Africa has shown that, when exposed to the realities of field work, development experts often complicated or subverted metropolitan ideology.[3]

In many ways, an examination of the work of Glenn Johnson and the CSNRD provides a useful corrective to a development historiography that has been overly focused on high theoretical perspectives emanating from Cambridge and Washington. First, Johnson and the Consortium (like many of their peers in USAID) were not primarily concerned with urban or industrial problems; they were animated by smaller-scale issues of rural life. Johnson and his team of scholars were concerned with increasing agricultural productivity and improving the quality of life in rural Nigeria. Second, whereas many of the scholars associated with modernization theory in the US had backgrounds in macroeconomics, Glenn Johnson was trained as an agricultural economist. Marion Fourcade has characterized the macroeconomics profession in the US as highly mathematized and abstract, and insulated from both other disciplines and state control.[4] The picture of agricultural economists is much more complicated. Agricultural economists like Glenn Johnson often began their careers in the employ of the federal government, were interdisciplinary in outlook, and were sensitive to the embeddedness of economic life. The interdisciplinary orientation of agricultural economists like Johnson led them to search for methodological alternatives when conventional approaches failed. Attentive to the complex social nature of economic life, Glenn Johnson and his colleagues in the Consortium saw in the systems sciences a way to unify their observations of rural Nigerian life into one coherent vision. For these scholars, the systems sciences provided an important coordinating function, ordering and consolidating knowledge garnered from a variety of disciplinary backgrounds.

Johnson's team was also attracted to the possibility of designing an interactive simulation of the Nigerian economy, which they hoped would offer Nigerian policy makers and USAID officials a way to experiment with policy alternatives and gain experience in running a national economy. Paul Edwards, in his article "The World in the Machine," has argued that systems models, like the famous World 3 model of *The Limits to Growth* publication of 1972 or the climatic General Circulation Models (GCMs) of the 1960s and 1970s, not only helped to establish computer simulation's

reputation as a technique of policy analysis; they also shaped the "background assumptions for a large subset of the world policy community."[5] By bringing the world into a unified cybernetic control scheme, World 3 and GCMs presented the globe as a unitary system and suggested possible interventions into long-term international processes. Similarly, simulation models like NASS allowed planners to manipulate policy variables interactively and at will; this gave them a sense of having a level of control over political and economic circumstances not available in real life.

By assimilating Nigeria into a unified cybernetic control model, the simulation models of development experts opened up the possibility of intervention into long-term economic and social processes. Moreover, these development simulations were not just important for what they explained about a specific development context, but for what sort of aspirations they *evoked* in decision makers. Writing about a very different kind of simulation—disaster preparedness drills—the anthropologist Andrew Lakoff has identified the production of an "affect of urgency" as an important function of disaster simulations.[6] Producing this "affect of urgency" with scenario drills gives participants a *feeling* of how an emergency might unfold in the absence of an actual emergency event.[7] Building on the work of Lakoff, this chapter shows how a group of designers attempted to operationalize a user's simulation experience to build trust in the NASS simulation software and the Nigerian futures it produced.

This chapter begins with a brief look at the state of economic planning in Nigeria at the time of the country's independence, paying close attention to Wolfgang Stolper's account of his time at the head of Nigeria's Economic Planning Unit. It continues with a discussion of the field work of the CSNRD in the context of widespread disorder and civil war in Nigeria. The next two sections explore the CSNRD's research program's curious afterlife as a source of development data for Nigeria, and adds a (brief) look at how the NASS's codebase was also used to produce simulations for the South Korean and Brazilian economies.

PLANNING WITHOUT FACTS

American involvement in the Nigerian national economy began soon after Nigeria gained its independence from the United Kingdom. From an early stage, American officials and development experts saw Nigeria as providing the setting for a "significant historical demonstration" of the quality of American technical assistance.[8] Wolfgang Stolper, a Harvard PhD and former student of Joseph Schumpeter, played an important role in defining the economic policy of the newly independent state. With Ford Foundation backing, the economist was dispatched to Nigeria to head its Economic Planning Unit.

Arriving in Lagos in 1961, Stolper was tasked with leading a team of Nigerian economists in crafting the National Development Plan for 1962–1968. Initially, he expressed a great deal of enthusiasm for the project, exclaiming "I have the chance to weld this territory [Nigeria] into a nation," but he soon soured on the prospects for the national development plan and for Nigeria more generally. Stolper (who once described himself "the best economist in West Africa") remained confident in the value of his personal expertise, but doubted the ability of Nigerian elites, who he saw as corrupt and overly entangled in patronage systems, to carry out the plan's recommendations. Furthermore, he lamented the "lack of facts" available from the colonial period while drafting the national development plan, arguing that the lack of statistical and social scientific knowledge about the country made planning exceedingly difficult.[9]

Out of this frustration came *Planning without Facts*, a book Stolper hoped would provide guidance to future planners and theorists working on problems of economic development in Nigeria and in other national contexts. The book was published in 1966, but circulated in manuscript form for several years before that. It argued that in the absence of statistical and social scientific "facts" about development, planners should decentralize decision-making, make use of indirect market-based incentives, and not interfere with price signaling mechanisms.[10] In short, Stolper argued that in development situations where the planner has low levels of information about a specific national context, authorities must relinquish central controls and keep long-term plans flexible and pragmatic.

The Consortium for Nigerian Rural Development (CSNRD) emerged, in large part, to redress the paucity of statistical and scientific information that Wolfgang Stolper had identified. The group was comprised of teams from four universities—Michigan State University (MSU), Colorado State, Kansas State, and the University of Wisconsin—plus three institutional partners, the Research Triangle Institute, the US Department of Agriculture, and the Department of the Interior. It was commissioned to appraise existing Nigerian and USAID programs for agricultural development, analyze "development potentials," and make recommendations for improving agricultural programs. In order to accomplish these goals, USAID tasked the CSNRD with studying the Nigerian agricultural sector "in its broadest context."[11] Glenn L. Johnson, an economist experienced with Nigerian agricultural development, was made the project's director.

Trained as an agricultural economist at the University of Chicago, Johnson conducted his earliest research at Kentucky State University's Agricultural Experiment Station. There, he created an econometric model of the US's burley tobacco industry.[12] In 1955, after receiving an appointment for a professorship in MSU's agricultural economics department, Johnson became convinced that the field of economics was too insular and that future research needed to account for institutional, technological, and social

change. Recalling these years, Johnson lamented that "though we did not realize it then, we were trying to compress a relatively productive multidisciplinary, problem-solving field of work into production economics . . . at the expense of destroying its technological, institutional, and humanistic breadth."[13]

In 1961, the US State Department sent Johnson to Thailand as part of an economic and military advisory team, his first experience with international development work. Even though the majority of Thailand's economic activity was agrarian, Johnson was the only agriculturalist on the mission. By the end of the project, he was very dissatisfied with the group's final product—a national econometric model—which, owing to the overemphasis of the "disciplinary" concerns of economists, he would later describe as "oversimplified, too macro, and naïve."[14] This first experience of development planning increased his wariness of narrowly disciplinary approaches that reduced the complexity of social systems to simple time-series data and maximization models. At the same time, he became convinced of the superiority of informal, ad-hoc projections that borrowed insights from decision-makers themselves and from "technical, institutional, and humanistic disciplines."[15] This interest in disciplinarily eclectic, pragmatic projection methodologies eventually endeared him to the interdisciplinary features of the systems simulation approach.

Johnson took this perspective with him to his first USAID contract in Nigeria, where he was named the first director of the Economic Development Institute at the University of Nigeria. During his two-year term at the helm of the Institute, Johnson maintained a methodologically eclectic approach and kept the group deliberately "unspecialized on any source or type of information or any computational technique."[16] By Johnson's own account, the Institute's research program gained the attention and respect of the country's policy officials, who drew on the group's publications when drafting Nigeria's national development plan. It was on the basis of this reputation that Glenn Johnson was named the head of the CSNRD.

MAKING DEVELOPMENT FACTS

Glenn L. Johnson left for Nigeria on March 23, 1965 to prepare for the arrival of the rest of the CSNRD team. He was met there by Vernon Johnson and Francis Jones, both from the USAID Mission in Lagos, who briefed Johnson on the agricultural programs of the mission. The following week, the three men toured the East and Northern Regions of Nigeria, making contact with Nigerian and USAID officials in those regions. According to a report of the forward planning team of the Consortium, both the meetings in Lagos and the consultations in the regions revealed that the team was aware of serious misgivings by Nigerian government officials about the activities of the CSNRD. Although the report noted that the fear of "external, overseas

planning of Nigerian affairs" tended to disappear when the project and its mandate were explained to skeptical officials, these anxieties continued to dog the Consortium throughout its period of fieldwork in Nigeria, and the Consortium's lack of credibility with policy-makers eventually jeopardized the continuation of the project.[17]

Although the Consortium's report from their tour of the country's regions makes no note of it, Nigeria had been undergoing a period of increasing sectional and interethnic tensions.[18] At the time of the advance team's arrival, Nigeria had just come through an unsettled, hotly contested election in December 1964. The political campaign had been marked by arbitrary arrests, intimidation, and ethnic violence. In the Northern Region, home to the ruling party's power base, opposition candidates had been arrested, denied entry to rallies, and imprisoned. In the face of widespread intimidation, one of the opposition parties had called for a boycott of the December elections. The boycott was only partially successful and the ruling party coalition, the Nigerian National Alliance, won an overwhelming victory. Following the certification of election results, President Azikiwe, a founder of the opposition National Council of Nigerian Citizens, refused to invite the formation of a National Alliance government by the reelected Prime Minister Abubakar Tafawa Balewa. Out of the stalemate, the two men reached a compromise that would require the formation of a unity government, and allow seats that had been boycotted in the December election to be recontested the next year.

An election for the Western Regional assembly was scheduled for October. This election essentially followed the pattern established during the December general election, with widespread charges of violence and voter suppression. On election day, October 11, 1965, regional Premier Samuel Akintola decreed that the election results were to be announced only at the central headquarters in Ibadan, instead of the normal practice of declaring vote tallies at local polling places. When the results were announced two days later, the official tallies put the ruling NNDP ahead, but both sides claimed victory. In response to widespread accusations of fraud, protests and riots took place across Nigeria's Western Region throughout November and December. Nigeria's first military coup began on the morning of January 15, 1966. Led by a group of officers that would later be called the "Five Majors," the plotters arrested all of Nigeria's regional premiers and executed several federal officials. In the chaos, John Aguiyi-Ironsi, the General Officer Commanding of the Nigerian Army, rose to be the Head of State of the Nigerian military government. After securing power, the new military government quickly outlawed political parties, deposed regional governors and replaced them with military governors.

About this time on a tape-recorded message to East Lansing, Glenn Johnson issued a report on the new political landscape in Nigeria and the implications of the change in leadership for the ongoing CSNRD. He noted that, in spite of the coup, things were generally quiet in Lagos. Despite

administrative reshuffling in the Nigerian government and general political uncertainty, Johnson remained optimistic about the CSNRD's progress, noting that the team members were "not letting minor difficulties serve as an excuse for not getting things done."[19] Around that time, Johnson was made aware of the military government's establishment of a National Advisory Committee for Agriculture earlier that year. Johnson suspected, judging from the committee's organizational structure, that its working groups were acquainted with and attentive to the CSNRD's research agenda. He accorded the highest priority to gaining the trust of this group of advisors:

> I found myself saying today that [the] CSNRD may have a real opportunity to relate itself to the National Advisory Committee, but that if it is unable to do so, that it probably should be abandoned. With this National Advisory Committee established, it seems to me that the CSNRD should not continue if its work is not to be used by this committee.[20]

Despite these high stakes, Johnson remained optimistic about the Consortium's ability to influence the commission.

His optimism, however, was tempered by embarrassing news from the US. The New Left magazine *Ramparts* had published reports in its April 1966 issue concerning Michigan State University's far-reaching involvement in covert CIA operations in Vietnam. The article, which launched a firestorm of criticism of US activities in Southeast Asia among members of the nascent anti-war movement, alleged that academics at MSU, under contract to the International Cooperation Administration (USAID's predecessor agency), had been training South Vietnamese police forces, purchasing firearms, and helping to write a new South Vietnamese constitution.[21] Johnson's recent optimism was "offset," as he put it, "by the most untimely publicity being given to the involvement of MSU with [the] CIA. I fully expect that sometime during this trip I will be charged with fronting for the CIA in an attempt to infiltrate the Nigerian planning organization, false as an accusation as that would be."[22] The contents of the article quickly became known among Nigerian policy officials, who did indeed become suspicious of USAID and the Consortium's activities in particular. Although he was not directly connected to the CIA's covert actions, Johnson later claimed that the "*Ramparts* article continue[s] to cause me considerable embarrassment" and hoped "that it [would] not lead to serious problems for the CSNRD."[23]

Later that summer, on July 29, 1966, Nigeria would see its second military coup of the year. A group of Northern NCOs and officers, dissatisfied with what they saw as an "Igbo conspiracy," captured and killed Head of State Johnson Aguiyi-Ironsi in Idaban. For three days, Nigeria had no head of government until a group of elite Northern officers selected thirty-one-year-old Yaubu "Jack" Gowan. The renewed political upheaval in the country sparked massive population movements and widespread political violence in the end of 1966 and into early 1967.

On December 15, 1966, in the Consortium's first meeting following the countercoup, the group began to discuss ways of putting the pieces of their research proposal together into a final set of recommendations to guide USAID and Nigerian agricultural planning. Noting the presence of what they called a "synthesis gap," the group struggled to show how the research group's activities fit into the Nigerian rural economy.[24] Several months earlier, Johnson had requested that the group's data be made available to researchers at MSU for use in the construction of computer simulation models. Drawing on the work of the simulation team and the consortium more broadly, Johnson announced that he was developing a flow chart that would show how USAID and Consortium activities fit into the Nigerian national economy.[25]

In March, the military governor of the Eastern Region of Nigeria, C. Odumegwu Ojukwu, declared that the regional government would take over all federal functions in the region, effectively declaring the autonomy of the Eastern Region. Upon returning to the US in early May, Johnson reported to the Consortium that "[p]rogress in general was very favorable and that work underway in Nigeria was not being impeded by internal conditions" but that staff recruiting had become difficult due to the political circumstances.[26] Furthermore, he noted that it was becoming apparent that the project's researchers needed to recognize regional differences within Nigeria, both because the recent upheavals had made ignoring regional concerns impossible, but also because Johnson thought that greater attention to these matters would result in more robust policy recommendations.[27]

The new Republic of Biafra, formerly the Eastern Region of Nigeria, was formally declared on May 30, 1967. This event marked a serious change in the tone in Consortium meetings. Johnson had returned to the US from Nigeria two days earlier to report that the political situation in Nigeria was "grim."[28] In order to respond to the changing political situation, the group developed a number of contingency plans for consortium activity in case of further deterioration. Meanwhile, Robert Brown at the USAID office in Washington reported that the USAID's policy for Nigeria was to "continue to the best of [our] ability," while acknowledging that as the "situation" there worsened, the Agency's range of action would become more restricted.[29] Johnson and Brown agreed that all future study activities would need to be "regionalized" as much as possible to benefit USAID missions in West Africa and elsewhere, a goal that would eventually come to fruition in MSU's simulation efforts.[30] The political realities continued to worsen until July 6, 1967, when civil war within Nigeria finally broke out.

Later, at the December 13, 1967 meeting of the Consortium in Chicago, it was noted with relief that internal disorder in Nigeria seemed to be "quieting down."[31] Furthermore, transit restrictions in the Western Region had been ended and consortium researchers had returned to work there. Researchers were also working again in the Northern Region, but public officials there were preoccupied with immediate "government problems" and were therefore not focused on longer-range development issues.[32] As a

result of the problems associated with doing research in a war zone—plus the inability to get data from the Republic of Biafra and the unwillingness of Northern administrators to cooperate with researchers—the Consortium now focused its efforts on the Western state, although discussion lingered on ways to gather information from the Northern, Eastern, and Midwestern Regions. It was further decided that several of the subprojects should be merged due to "Nigerian contingencies." These included USAID restrictions on movement, and the need to "round out" works in progress.[33]

In the Consortium's final meeting on September 6, 1968, Jim Emerson of USAID in Washington reported that the agency was pleased with the Consortium's activities and was incorporating CSNRD reports into program materials for the Lagos mission. For reasons beyond the Consortium's control, however, political circumstances in Nigeria made implementation of the group's recommendations impossible. In addition to the fallout from the civil war, there had been a number of problems with the CSNRD's research program in Nigeria. The group had been inattentive to the politics of sectionalism in the country and this had compromised their ability to interact with regional decision-makers and administrators. This problem had been compounded by the negligible participation of Nigerians in an authorial or consultative capacity, an omission which had further undermined the project's credibility in Nigeria.

On a more methodological level, the "synthesis gap" that the group had identified had never been completely resolved, and consequently the CSNRD's final report had no real unifying theoretical or disciplinary perspective. Finally, internal strife in the country had exposed the very idea of "Nigeria" as an artificial, colonial-era political creation. As the CSNRD wound down its operations and Nigeria dissolved into a bloody civil war, researchers at MSU set about programming a software suite that would allow Nigerian and USAID officials to experiment with policy proposals that would unfold within a simulated, virtual Nigeria. This simulation was constructed around Consortium data and offered essentially the same policy recommendations as the CSNRD. However, this American-crafted model would gain enough credibility with the Nigerian military government for them to use the software to draft classified economic development planning documents in the early 1970s.

PROGRAMMING A VIRTUAL NIGERIA

Glenn L. Johnson, even before the conclusion of the CSNRD's research activities, had expressed serious doubts about the Consortium's ability to meaningfully synthesize its work using conventional methods. Early in his tenure as CSNRD director, he began to look for ways to systematize and present the group's data and recommendations. Shortly after the start of the Consortium's field work, Johnson attended a conference where Albert

Halter, an economist based at Oregon State, gave a paper presenting his work on watershed management and development using a systems simulation method. Johnson was immediately taken with the flexibility and cost effectiveness of the approach. Even more, he was impressed with the way computer simulation conveyed complex policy information to public officials, noting with excitement "[t]he print-outs look more like the menus one inspects when he goes out to a restaurant than the solution to a linear programming problem."[34] The value of this approach, aside from its low cost and high speed, was that it allowed Oregon officials to imaginatively enact and experiment with different policy alternatives and to see their administrative domain as an apolitical, unified, and closed system—all with the ease of ordering an entree from a restaurant menu. Simulations also enabled these officials to think of the future in plural terms. In a sense, the Oregon watershed simulation allowed officials to generate a slate of alternative future scenarios and identify and optimize attractive ones. By bringing present and future into one cybernetic control scheme, computer simulations aided policy planners in imagining the future as a political site of intervention and even control.

After hearing Albert Halter's conference presentation, Johnson began to investigate the possibility of using computerized systems simulation methods in the work of the Consortium. With a grant from MSU, he organized a conference to explore the feasibility of employing this methodology in the Nigerian context. Although the conference was well attended, with Wolfgang Stolper and several systems experts from the space industry in the audience, it was concluded that the simulation approach was not sufficiently developed for the Consortium to make use of it.[35] Consequently, the CSNRD continued using conventional pencil and paper methods of sector analysis.

Although the conference concluded that software suites and modeling methodologies were not ready for generalized, national-level simulations, Johnson was granted a separate USAID contract in 1967 to develop this approach. Because the Research Advisory Committee of USAID was skeptical about computerized economic analysis, it was decided that the simulation team would spend a year constructing a subsector model and that subsequent funding would be awarded only if the approach was deemed successful. The team chose to create a model of the northern Nigerian beef industry, because, as Johnson noted, "simulation requires that something from the real world be modeled . . . [and] we knew a great deal about Nigeria as a result of the CSNRD study."[36] In other words, they had the "development facts" to work with. However, there was another reason for this decision as well: the team chose to model the northern beef industry specifically because the earlier beef subproject of the CSNRD study had been canceled due to the "secessionist difficulty" in Biafra and because they wanted to make some use of data that had already been collected.[37]

In spelling out the significance of their simulation approach for USAID and Nigerian policy officials, Johnson and his simulation team pointed to

a farm management simulation called "Simfarm,"[38] which had been developed by MSU's Warren Vincent to teach farm management as a dynamic, interactive game.[39] This early form of "gamification" enabled students to experiment and gain experience with management strategies without the normal computational burdens of pencil-and-paper projections. In this game, the student made management decisions, which were inputted into the computer, after which Simfarm immediately presented the students with the consequences of the user's decisions. Johnson and his coauthors saw their beef subsector model as a macro-level version of this simulation, one that would allow USAID and Nigerian officials to experiment with different policy proposals, giving them hard-to-come-by experience with policy interventions in a complex economic system.[40] Indeed, at the time of the construction of the model the Nigerian Civil War was still raging; thus the "virtual Nigeria" of the modelers enabled users to experience a unified Nigeria that did not exist in the real world.

The simulation team succeeded in convincing USAID of the value of the approach and in 1968, the agency extended the duration of the contract and tasked the group with creating a sector-wide simulation of the Nigerian agricultural economy. Thomas Manetsch, a professor of electrical engineering and systems science at MSU was an important figure in the adaptation of the Consortium's research with the systems perspective. Manetsch had written his dissertation on a simulation model of the US plywood industry, based on Jay Wright Forrester's industrial dynamics approach to systems modeling. Manetsch's model simulated the activities of several thousand firms involved in the production, retail, and wholesale sectors of forestry, incorporating a simulated price mechanism and a system-wide distributed delay process to model industrial production and information-response lags.[41] Manetsch, along with several MSU graduate students working in systems science, brought their considerable modeling expertise to the production of the Nigerian Agricultural System Simulation (NASS). Gloria Page—who was a programming instructor at MSU and, incidentally, the mother of Google cofounder Larry Page—was one of the NASS's lead programmers.

The completed national model, initially hosted on a CDC 6500 computer on MSU's campus, was capable of analyzing and investigating the consequences of various agricultural policy options and was able to take account of the implications of non-agricultural economic developments as well as interactions with the international economy. In total, the model was composed of some 3,000 equations. A forty-two-year simulation run required about a minute to execute.[42] To ensure that it would be adaptable for a variety of scenarios, the model allowed users to evaluate policy alternatives by altering an array of performance variables, including nutritional levels, total value added, export amounts, and GDP. This model for Nigeria was composed of two regional submodels, a northern one and a southern one (albeit with regions based on ecological, rather than political boundaries) and a noneconomic sector submodel. In this way, the NASS was able to sidestep

the thorny problems of regional and ethnic strife by dividing Nigeria into ecological regions.[43] This ecological regionalization—while still dividing the country—did so in an "apolitical" way. These were not intended to be administrative units, rather they were imagined as reflections of different patterns of agriculture in different ecological zones.

The team that created the NASS had two sets of goals in mind. First, the team wanted to create a computer simulation that would serve as a training and experimental environment for economic development officials. In essence, they wanted the NASS to work something like a disaster drill or a war game where participants were called upon to imaginatively enact the assumptions of a military strategy or a disaster plan. The NASS was intended to work in a similar way, allowing new Nigerian and international development officials to gain experience in managing a national economy and to internalize the economic logic of the underlying model. Second, the MSU simulation team intended to establish a body of source code that could be used in other national contexts. In this way, the group hoped that their simulated Nigeria could, with slight tweaks to the model, stand in for any "Least Developed Country."

By presenting decision makers with an easily controllable interface with simplified summaries of simulation data, the MSU simulation team expected the model would gain credibility in the Nigerian policy community. To deal with this, the manufacture of credibility was built into the model construction procedure itself, with the simulation team creating an algorithmic meta-model for the design process. The designers of the NASS model imagined the construction of a system simulation as an iterative process; in their view, the model was never considered "finished," as policy-maker inputs, and new, more complete real-world data could be used to fine-tune or radically adjust the model at any point. As Figure 8.1 shows, the NASS simulation designers viewed the construction of the model as a phase in a larger decision-making process. This flowchart shows the MSU team's imagination of ideal simulation model production, with feedback from advanced stages of the process informing every earlier stage of the process in model adjustment. By integrating decision makers into the model construction process, and the simulation model into a larger policy choice process, the model builders hoped to make decision-makers invested in future model construction, evaluation, and experimentation. In the words of Glenn Johnson and George Rossmiller, by ensuring their patrons' participation throughout the design phase, "formal models can become institutionalized directly into the decision structure as part of the investigative capacity. Hence, the credibility gap often observed among decision-makers, professional analysts, and modelers is greatly diminished."[44]

In a comparable manner, the MSU simulation team also sought to appeal to decision-makers through thoughtful interface design. The group emphasized the necessity of clear variable input prompts and easily readable simulation outputs.[45] To this end, the team developed a front-end simulation

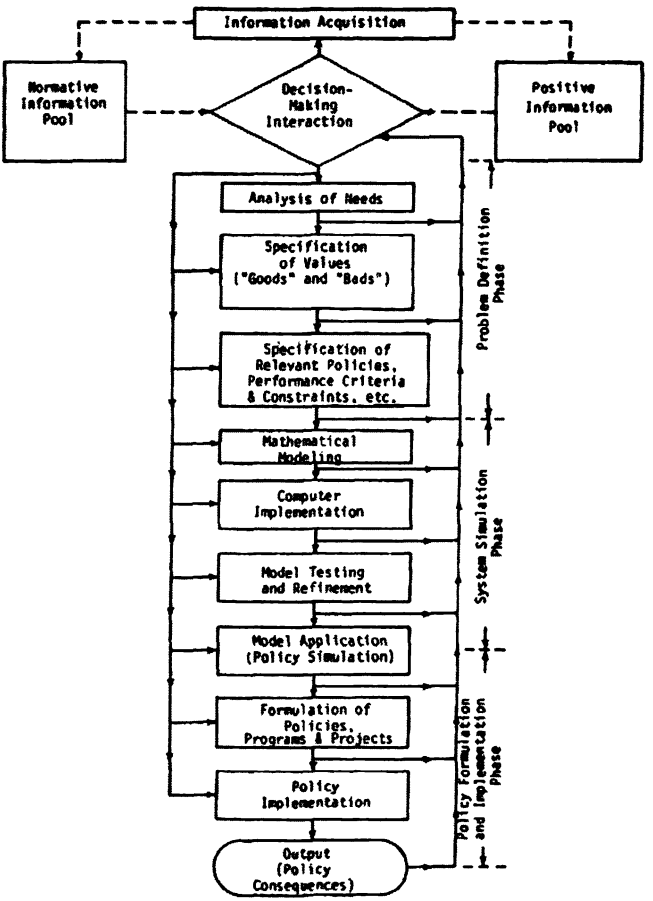

Figure 8.1 System simulation and the decision-making process, from Glenn Leroy Johnson and George E, Rossmiller, "Improving Agricultural Decision Making: A Conceptual Framework," 48.

program called the Policy Analysis Language. Designed to make computer simulation models more easily accessible to novice users, Policy Analysis Language offered a "conversational" terminal interface that would communicate with the model's FORTRAN back-end. The interface offered policy-makers two separate tracks of command entry. For the nontechnical user, Policy Analysis Language presented a series of natural-language questions, each with instructions for entry. At any point, the end-user could enter an "E" for a more detailed explanation about a specific question. Conversely, the conversational interface could be overridden and commands could be used to execute model functions if the user was familiar with the intricacies of the program's back-end.[46] On the output end, the team stressed the importance of clear and easily understandable policy data, asserting that "considerable effort often must go into the design of special

tables and graphs that will readily communicate with decision-makers and evaluators."[47] By presenting decision-makers with an easily controllable interface and simple outputs, the MSU simulation team expected that the simulation would gain credibility in the Nigerian policy community.[48]

With the credibility of the modeling approach defended to the team's satisfaction, they could move on to the more phenomenological aspects of software design. Arguably, the most important affective response simulation modeling provided planning officials was the experience of experimentation. Michael Abkin, a MSU graduate student who wrote the southern submodel of the NASS for his doctoral dissertation, framed the problem facing development officials this way: "Policy making is a process immersed in uncertainty because it concerns the future. Development policy making is submerged to uncertainty's darkest depths due to the immensely complex (and thus still imperfectly understood) process of economic development."[49] By giving policy planners this experience of experimentation, regardless of the accuracy of the model, some of this perception of uncertainty is removed. The MSU simulation team justified the high cost of developing simulation models in these terms. As Kwon-Yaun Chong, one of the NASS's designers, noted, these costs were "quite small compared to the price which society will pay for mistaken policies and programs in designing the development strategy."[50] In the face of potentially disastrous social costs, this experimental enactment of policy alternatives served an important defensive function.

In order for the NASS to be successful as an experimental platform, the model builders first had to re-imagine the Nigerian agricultural economy as a unified cybernetic control system. As mentioned above, the design of the NASS incorporated two regional submodels that corresponded to ecological divisions rather than to Nigeria's ever-changing political or ethnic boundaries. This allowed policy-makers to imagine a national economy in which conflicts over federal and regional administration of agricultural policy and sectional strife could be ignored. In essence, the NASS—with its presentation of Nigeria as a diverse-but-unified country that operated as a closed, rational system—allowed policy makers to experience an idealized version of their country.

PROGRAMMING PLACELESSNESS

The systems sciences, with their focus on structural and functional isomorphies across systems, served as a perfect shuttle for transporting CSNRD-collected knowledge from locale-specific, discipline-oriented information to abstract, universal forms. The work of the sociologist of knowledge Thomas F. Gieryn speaks to the strategies that social scientists like the consortium members have used to manage issues of site specificity and generality. He distinguishes between the "field site" and the laboratory as two contrasting but interrelated frameworks by which social scientists understood their object of study as a "truth spot," Gieryn's term for a

"delimited geographical location that lends credibility to claims." By "field site," Gieryn means a specific location that can be treated as possessing the qualities of a "natural object." Viewed through the frame of a field site, the location being studied becomes a natural thing. In an important sense, social scientists see field sites as not constructed, but found and observed in their "original and unsullied state." By contrast, Gieryn describes a laboratory as an artificial and controlled environment that allows for easy generalizations outside of the fixed "placeness" of a unit of analysis. He does not see these two varieties of "truth spots" as mutually exclusive—rather he argues that social scientists shifted between them depending on the sort of claim being made:

> On some occasions, the city assumes the qualities of a lab: a restricting and controlling environment, whose placelessness enables generalizations to 'anywhere', and which demands from analysts an unfeeling detachment. On other occasions, the same city becomes a field-site, and assumes different qualities: a pre-existing reality discovered by intrepid ethnographers who develop keen personal sensitivities to the uniquely revealing features of this particular place. As Chicago-the-city is textually shuttled back and forth between laboratory and field-site, the claims about metropolitan life by Chicago School authors take on credibility by being situated in the complementary legitimating languages of both truth-spots—lab and field.[51]

In a similar fashion, experts affiliated with the CSNRD strategically alternated between treating Nigeria as a field site and a laboratory. The early work of the consortium was aimed at studying and transforming the agricultural conditions of Nigeria itself. But the volatility of Nigerian national politics during the civil war made it unlikely that their recommendations would be implemented any time soon. Faced with uncertain research and professional prospects, these development experts attempted to take the lessons they learned from the Nigerian study and apply them to problems of rural development in other national contexts.

To make such claims plausible, however, they were obliged to create a new theoretical framework whereby "development facts" could be wrenched from their local, field-site specific context into a general, synthetic framework that could be applied—with some calibration—to any arbitrarily chosen development environment. The systems perspective, which stressed the importance of identifying homologies across different types of systems, was a useful way to assimilate site specific knowledge into a more universal framework. In essence, NASS transformed Nigeria from a "field site" into a development "laboratory." After designing the Nigerian simulation model, the MSU team designed two more systems simulations based closely on its experience: one for the South Korean agricultural sector, and one for that of Brazil. In designing these new simulation models, the MSU team drew upon the work begun in the Nigerian simulation,

incorporating their knowledge of the Nigerian agricultural economy and their impressive software library.

From the very beginning of the NASS project—and the collapse of their data-gathering efforts in Nigeria—the MSU simulation team imagined their project as the first step to the construction of a more generic model that could be modified to suit various local conditions. Kwon-Yuan Chong noted after the completion of the NASS national model that the team's initial concern was "to develop system simulation computing features that are applicable to the analysis of the planning problems of other economies." Given MSU's considerable expertise in Nigerian agricultural economics, the team decided to use that country as a case study to test and validate the functionality of the general systems approach.[52]

Alongside the construction of South Korean and Brazilian models, USAID commissioned the systems simulation team to develop a generic software library, CLASS, or the Computer Library for Agricultural Systems Simulation. The library, which was constructed from "genericized" components from the Nigerian simulation, contained model subroutines that, with some modification, could be usable in any national context. Among the first subroutines developed for the library were a basic demographic model, a system for national agricultural accounting, and an input-output macroeconomic model, which linked the agricultural and non-agricultural sectors.[53]

The use of Nigeria as a "development laboratory" to create South Korean, Brazilian, and generic development simulation environments is just one example of experts attempting to make development knowledge portable in the face of a political crisis. The political upheavals associated with the Cold War and decolonization destabilized the "professional geographies" of many development experts. As Donna C. Mehos and Suzanne M. Moon have noted, technical experts were often forced to apply highly localized knowledge amassed after decades of research to radically different occupational environments. Consequently, many Cold War technical experts developed methods for translating location specific, "place-based" knowledge, to more "portable," generic forms of knowledge.[54] In a similar way, James Ferguson has shown how constantly rotating cadres of international development experts have applied fairly uniform policies across widely divergent development contexts, regardless of the social, political, or economic realities on the ground. Never in one place for too long, these experts lacked concrete knowledge of any specific place, but they did develop a generic, placeless kind of development expertise. As Ferguson puts it, "Tanzania may be very different from Lesotho on the ground, but, from the point of view of a 'development' agency's head office, both may be simply 'the Africa desk.'"[55] Thus, the Cold War and decolonization produced the placeless development expert, and the placeless expert produced the generic "Least Developed Country" as an object of knowledge and intervention. The generic CLASS library, which could be adapted to stand in for any developing country, promised to make the simulation knowledge developed for Nigeria placeless and portable.

CONCLUSION

As this chapter has explored, Glenn Johnson and his colleagues, anxious about the status of their professional authority, "delegated" the problem of credibility generation to an interactive computer simulation. Although the use of a computer program to build trust with an end-user might have been a new strategy, the strategy of replacing expert authority with that of the authority of a methodology was not. Theodore Porter has written extensively about the gradual displacement of expert authority and discretion by numerical measures of value. Over the course of the nineteenth and twentieth centuries, trust in an expert's knowledge and skill has gradually been replaced by trust in quantitative, rule-governed methodologies. This shift had less to do with a story of scientific or methodological "progress," and more to do with a gradual democratization of expert professions, especially in the civil service. These newer bureaucratic actors lacked the traditional, "gentlemanly" trappings of authority, and thus were more vulnerable to the scrutiny of outsiders. "The appeal of numbers is especially compelling," Porter argues, to officials "who lack the mandate of a popular election, or divine right."[56] For these experts, a decision based on explicit, "objective" measures can insulate these actors from claims of bias or partiality. "Scientific objectivity," Porter claims, "provides an answer to a moral demand for impartiality and fairness. Quantification is a way of making decisions without seeming to decide. Objectivity lends authority to officials who have very little of their own."[57]

Glenn Johnson and his colleagues faced a similar challenge. Like Porter's experts, they could not rely on the authority of their professional expertise to justify their claims. But neither could they rely on "objective" quantitative measures to augment their limited credibility. The designers of the NASS simulation recognized this and were aware of the fact that they were faced with the unenviable task of making policy recommendations in an atmosphere of mistrust with an unproven methodology. With this in mind, they sought to build the production of credibility explicitly into their simulation methodology. Thus, in many ways, the most important product of the Nigerian simulation might have been user "trust," not the quantitative data it generated.

Part of what makes interactive policy simulations so compelling to their users is that they provide the experience of choice and control in a way that deciding among traditional policy proposals does not. Users are themselves enrolled in the data production and policy choice process. They are empowered to adjust inputs and alter the settings of a simulation, in other words they are enabled to produce and experiment with possible futures. But not all futures in policy simulations are created equal. By altering the context of a decision-making process, computer simulations can lead users to arrive at different decisions without necessarily changing their underlying preferences. Simulations like the NASS circumscribe the spectrum of possible decisions and tend to privilege the "default" settings chosen by the developers.

Unlike the experts Porter describes, however, Glenn Johnson and his colleagues did not attempt to appeal to decision-makers through recourse to impersonal, "objective" numbers, at least not primarily. Instead, they drew on the subjective experience of the simulation's users to add credibility to the model. Although the research and recommendations of the CSNRD were considered by most observers (including the project's funders at USAID) to be of very high quality, the project failed to fulfill its patrons' hopes. The NASS model, conversely, enjoyed a great deal of success in Nigerian policy circles. Indeed, a long-term agricultural planning document produced by the Nigerian military government in 1974 used the NASS model to understand the prospects of the national economy.[58] As I have suggested, the two projects were based on virtually identical data gathered by the same personnel, who came to the same policy recommendations. The key to the NASS project's success in persuading Nigerian policy-makers lay more in the experiential qualities of simulation than in its empirical superiority. These affective qualities of the simulation, its designers hoped, would allow Nigerian policy makers to experiment with policy alternatives, imagine themselves in possession of an unrealistic level of political control, and think of Nigeria as a harmonious, rationally-organized, closed system. In combination, the designers of the NASS hoped that these features would make its users feel that they were, so to speak, "in the driver's seat," so that they could imagine the future as an object of experimentation, intervention, and, ultimately, control.

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