Offshore Outsourcing: Counteracting Forces and Their Dynamic Effects

Amitava Dutta
School of Management MSN 5F4
George Mason University
4400 University Drive
Fairfax, VA 22030-4444
USA
adutta@gmu.edu

Rahul Roy
Management Information Systems Group
Indian Institute of Management Calcutta
Joka, Diamond Harbour Road,
Calcutta 700 104
INDIA
Rahul@iimcal.ac.in

Abstract

Many argue that offshoring is an inexorable trend since IT skills have become a global commodity and they are vastly cheaper in other parts of the world. According to this view, most IT work would be drained from the US to overseas locations. However, opposing factors exist. The loss of jobs to offshoring has raised pressure for political action. On the supply side, as developing nations get wealthier, they become less attractive for offshoring. In short, there are multiple factors – some enhancing, others inhibiting – that interact to drive offshoring. In this paper, we use the system dynamics methodology to build a two-country simulation model of offshoring growth that captures the interaction among its major drivers. The model will help us understand the offshoring phenomenon, by identifying the main feedback effects that intensify or temper the growth in offshoring. It can also be used for policy analysis and business planning.

1. Introduction

In the simplest terms, offshoring is moving all or part of your work to another country with cheaper labor. While offshoring occurs in practically all industry sectors, the offshoring of work in the IT sector has attracted considerable attention in recent times [1], [2], [3]. We use the term 'IT sector' broadly to both computing and telecommunications since the two are now so closely joined at the hip, so to speak. The offshoring of IT work can take different forms. Sometimes it is structured as an outsourcing contract, where a local firm in the outsourcee country does the work. It may also be structured as a joint venture or as a wholly owned subsidiary. The Jack Welch research center in Bangalore, India is an example of the latter. For most companies, the main goal of offshoring is reducing the cost of doing business. As competition ratchets up, firms in countries such as the US find that they cannot ignore the offshoring phenomenon. They are being forced to consider it in developing their competitive strategies. For instance, according to a December 2003 Deloitte and Touche report, telecommunications companies report an initial savings of 20-30% from their offshoring efforts, which higher gains expected as they gain experience with the activity [4]. The report calculates that by 2008, telecom operators will save $14.5 billion annually by offshoring. Over time, the scope of activities that are being offshored has also increased. Initially, limited and well defined software tasks, such as maintenance of a billing program, would be sent overseas. Now, entire business process segments are being offshored, giving rise to a new acronym – BPO (business process outsourcing). However, while cheap, educated and technically qualified labor remains the primary draw in offshoring IT work to countries such as India, offshoring does come with challenges. The two big challenges are the added complexity of managing at a distance and the potential loss of control. Additionally, cultural differences can cause additional problems. Dell Corporation recently withdrew some of their business customer service operations from Bangalore back to the US in the face of customer complaints about service quality stemming from language problems and other cultural differences [5]. Several other offshoring missteps can be cited [6]. Despite such missteps, the business impetus for offshoring remains strong.

As the volume of offshoring activity continues to rise driven by the compelling economics, it has induced a variety of reactions on both sides of the phenomenon. These reactions are beginning to have an impact on the offshoring phenomenon. On one side – e.g. the US – offshoring has created fear and aversion in the public at large. Fear stemming from concerns about job security and aversion stemming from nationalistic sentiments: "how can a company that advertises itself as American, have its customer support in India" was the reaction of one US customer to Dell's decision to offshore the activity [7]. At a recent discussion on the phenomenon [8], panelists cited a variety of concerns regarding the offshoring of IT work in particular. They mentioned that the US labor force was able to react to the offshoring of manufacturing jobs by retraining for service jobs. But now that they see service jobs – including knowledge based jobs - being sent abroad, and they do not see an alternative. And the trend is expected to get worse.

25,000 US tax returns for 2003 were prepared in India. For next year, contracts have already been signed to prepare 300,000 tax returns there. Predictably, such widespread concern has attracted political attention, resulting in governmental efforts to mandate restrictions on offshoring activity. For instance, several states are considering, legislation requiring that work on state funded projects – whether IT or otherwise – be carried out within the US and by US workers only [9]. While final passage of these bills are far from assured, clearly there is political pressure building to stem the tide of job loss resulting from offshoring [18].

On the other side – that of the outsourcee country – offshoring means a steady source of high paying jobs, at least relative to local salary standards. For instance, workers in the IT sector in India have seen steady increases in salaries and the number of workers engaged in that sector continues to climb rapidly. Apart from improved job prospects and quality of life, offshoring has generated a considerable amount of national pride in that its human capital is seen as being competitive on the global stage. Countries such as India have found new found respect as players in the global economy stemming from their success in offshoring, and this has had ripple effects in other sectors of the local economy as well. The positive impact of the offshoring industry has attracted the attention of industry leaders and the government establishment. Currently, their reaction has taken two forms. On one front, they are aggressively engaging the press to protest protectionist moves in outsourcer countries such as the US [10]. On the second front, they are crafting policies at the state and federal level that would make their home country an even more attractive destination for offshoring [11], [12], [13].

The observations made in the preceding narrative show that the offshoring phenomenon is a result of the interaction among different forces, some of which act to accelerate the phenomenon while others act to inhibit its growth. Moreover, it is clear from the above that there are reactive forces in play. For instance, as offshoring has increased, there has been a backlash against it, reducing the propensity to offshore. Due to the multiplicity of interactions among these counteracting forces, it is difficult to deduce their collective effects on the offshoring phenomenon, in order to assess how the phenomenon would evolve in the future. Such an assessment would be of interest to different stakeholders in both the source and destination countries involved in offshoring. While there are numerous articles that report summary statistics of offshoring activity [14], few if any, formally analyze the forces driving this pattern of activity. Therefore, the objective of this paper is to develop a reasonably rigorous model of the main forces driving offshoring, and their interaction, and then use the model to analyze how the offshoring phenomenon might evolve under different scenarios. By choosing a modeling methodology that facilitates the formal representation of these interactions, we can computationally examine offshoring growth using the model. The remainder of the paper is organized as follows. Section 2 discusses the choice of methodology, and a basic offshoring model is developed in section 3 using it. Section 4 discusses some experiments conducted using the model and the implications of these results. In conclusion, we note the model's potential for use in policy analysis and business planning, and discuss extensions that would make the current model more comprehensive.

2. Modeling Methodology

We choose to model the offshoring phenomenon using the system dynamics methodology [15]. A system is simply a structured collection of components. Each component has its individual properties, but it also interacts with other components in a way that is determined by the structure of the system. The behavior of a system – i.e. its dynamics - is determined both by the properties of the individual components as well as their pattern of interaction. Hence the name system dynamics. The mantra of system dynamics (SD) is "structure determines behavior". The aim of an SD model is to express this structure in a formal manner that lends itself to computational representation and analysis. It does so by representing a system as a collection of differential equations consisting of so called stock, flow and auxiliary variables [16]. Fortunately, for purposes of narration, it is common practice to represent this same structure in a much more visually appealing and comprehensible graphical form called causal loop diagrams (CLDs). Details of the methodology may be readily found elsewhere [16] and are not repeated here. The essential elements will be introduced in the next section at the same time that the offshoring model is presented.

A system may be physical, as in the case of a car. Its major components would be the chassis, engine, suspension, transmission, wheels and driver controls. Depending on the properties of these components and how they interact, one could get the driving behavior of a family car or a sports coupe. But a system may also be social, economic or political in nature, or even a combination thereof. For instance, for marketing purposes, one could conceive of a system that consists of the physical attributes of the car, its price, customer's preference structure and their financial status. The properties of these individual components and the pattern of their interaction would determine the 'behavior' of this system – which would be the buying pattern for the car. SD has a long history of being successfully applied to analyze problems in a variety of application domains including environmental policy, corporate strategy, healthcare, operations management and change management [17]. The offshoring phenomenon that we want to analyze is behavior generated by a socioeconomic system consisting of different components mentioned earlier in the narrative above. Therefore SD is especially well suited to capture the structure of this system and examine its behavior using computational techniques.

3. A Basic Offshoring Model

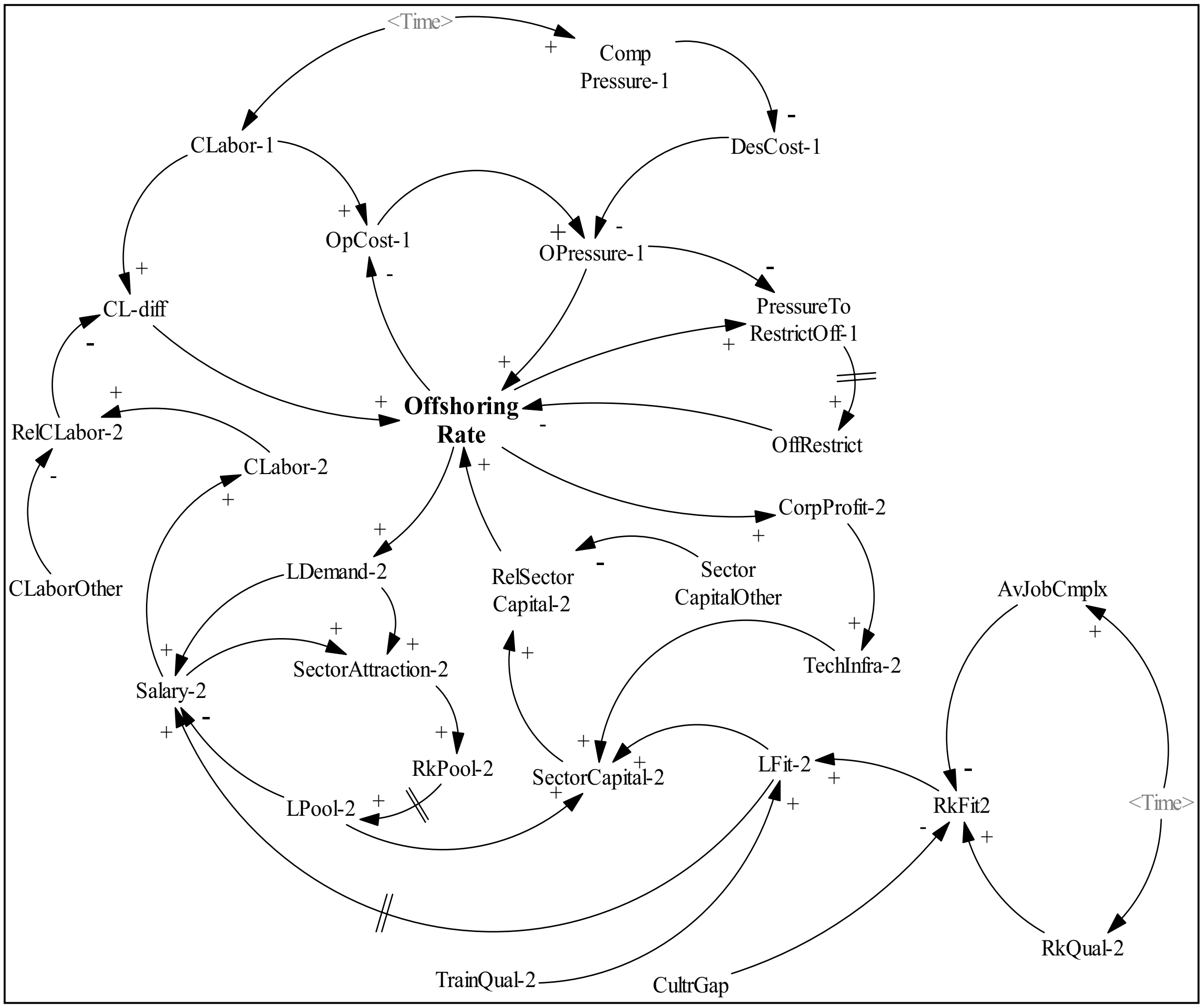
For this initial study, we consider the basic scenario in which there are two countries engaged in offshoring. (The multi-country case involves the same factors on a larger scale and will be addressed in subsequent work). One is an industrialized country with high labor costs and an advanced IT sector. The United States would be a prime example of such a country, with the United Kingdom, France and Germany being others. The second is a developing country in which labor costs are low, there is a growing pool of technically qualified labor, and is otherwise suitable for transfer of IT work. India would be a good example of such a country, China, the Philippines, east European countries and Ireland being others. Using the SD methodology mentioned in the previous section, Figure 1 shows the causal loop diagram (CLD) for our 2-country offshoring model. We now proceed to explain the structure of this model and show how it captures the major factors affecting offshoring that were mentioned earlier in section 1. Most of the variables shown in Figure 1 have the suffix 1 or 2. Since we are examining the two-country base case, 1 refers to the country from which IT work is being sent out, while 2 refers to the country into which IT work is flowing.

Before we do so however, it may be prudent to define the notation used in Figure 1 since the SD methodology has not been frequently used in the MIS literature. The basic building block of the CLD in Figure 1 is a causal link. This is simply a directed arrow from one variable to another, the former being the cause and the latter the effect. Furthermore, in most cases, the link will have a polarity shown near the head of the arrow. The meaning of this notation is explained using an example from Figure 1. The abbreviated variable names from Figure 1 are being used here in the narrative. The reader should refer to the legend in Figure 1 for the full description of each abbreviated name.

Take the link from CLabor-1 to OpCost-1 in the northeast corner of Figure 1. The direction of the arrow means that CLabor-1 (the average cost of labor in country 1) is the cause and OpCost-1 (average operational cost in country 1) is the effect. So the tail of an arrow is always the cause while the head is the effect. This link has a positive polarity, which means that the cause and effect change in the same direction. If the cause increases, the effect increases and vice versa (note that the positive polarity does not mean that Opcost-1 only increases). Surely, if labor cost increases, so does operational cost, and vice versa. On the other hand, consider the negative polarity link from LPool-2 to Salary-2. As before, LPool-2 is the cause while Salary-2 is the effect. The negative polarity means that cause and effect change in opposite directions. In particular, if LPool-2 decreases – i.e. the supply of qualified workers shrinks – Salary-2 will increase. If LPool-2 increases, Salary-2 will decrease. The polarity of this link follows from well established principles of supply and demand.

Now that the basic building block has been presented, we can use it to define a more aggregate structural component – the feedback loop. A feedback loop is a sequence of causal links that starts at a cause, goes through two or more causal links and loops back on to the starting cause. For instance OffShoring Rate $\rightarrow^{-}$ OpCost-1 $\rightarrow^{+}$ OPressure-1 $\rightarrow^{+}$ OffShoring Rate is a feedback loop in Figure 1. A feedback loop with an odd number of negative links is a negative feedback loop, while an even number of negative links results in a positive feedback loop. Therefore, the loop just mentioned above is a negative feedback loop. It can be shown theoretically that positive loops generate exponentially increasing behavior, while negative loops generate goal seeking stabilizing behavior [16]. Hence, by examining system behavior and then the major feedback loops and their polarities in the corresponding CLD of the system, it is possible to uncover the underlying mechanics that is generating system behavior over time. This helps to assess how system behavior – offshoring rate in our case - is likely to evolve in the future under different policy and environmental conditions. Clearly, given the importance of offshoring, such an assessment would be of interest to the different stakeholders involved.

We now proceed to explain how the structure of Figure 1 captures the major offshoring factors mentioned in section 1. In view of space constraints, we will only discuss the main causal effects instead of each individual link in Figure 1. Recall from section 1 that competitive pressures are forcing companies to lower their desired



Legend for Variable Names:

Country – 1(2): country from(to) which IT work is being offshored

CLabor-1: average cost of IT labor in country–1 ***CLabor-2***: average cost of IT labor in country-2
CLaborOther: average cost of IT labor in developing countries other than country-2
LPool-2: size of trained IT labor pool in country-2. ***RkPool-2***: size of entering rookie labor pool in country-2
LDemand-2: demand for IT labor in country-2. ***CultrGap*****:** cultural difference between country 1&2
AvJobCmplx: Average sophistication of IT work that is offshored from country 1 to 2
RkQual-2: average quality of untrained rookies entering the IT workforce in country 2.
RkFit-2: Fitness of entering rookie labor force to execute offshored tasks.
SectorAttraction-2: attractiveness of IT sector to labor pool in country-2.
SectorCapital-2: size and quality of IT human resource and infrastructure in country 2.
SectorCapitalOther: average size and quality of IT human resource and infrastructure in developing countries other than country 2.
OpCost-1: average operational cost for firms in country 1
OPressure-1: Pressure to offshore IT work out of country 1
CompPressure-1: competitive pressures faced by firms in country 1
PressuretoRestrictOff-1: Political pressure to introduce restrictions on moving IT work out of country 1
Offshoring rate: the amount of IT work offshored out of country 1 in a given time period.

Figure 1. Causal loop diagram of 2-Country offshoring model

operating cost, and they are looking to offshoring as one way to do so. In Figure 1, this chain of effects is represented by the following causal links: CompPressure-1 $\rightarrow^{-}$ DesCost-1, DesCost-1 $\rightarrow^{-}$ OPressure-1, OPressure-1 $\rightarrow^{+}$ Offshoring Rate. Now as offshoring activity increases, operating costs decrease and this in turn eases the pressure to offshore. This corrective effect is represented in Figure 1 by the following links: Offshoring Rate $\rightarrow^{-}$ OpCost-1, OpCost-1 $\rightarrow^{+}$ OPressure-1. In short, we have a negative feedback loop here, driven by competitive pressure. In other words, as competitive pressure increases, the negative loop acts to compensate for that effect by increasing offshoring activity. That is what negative loops do – they are goal seeking or stabilizing forces. Now if no other effects were in play, this negative loop would mean that offshoring would continue indefinitely until all jobs were sent abroad. That does not happen in real life, so there must be other countervailing forces, several of which were mentioned in section 1. We now discuss how these supply-side (in the sense that these countries are supplying the labor needed for offshoring) factors are represented in Figure 1.

Clearly, although competitive pressures encourage cost reduction, the relative labor rates in the two countries are an important driver of offshoring as the means to do so. The cheaper that country-2 is, relative to country-1, the more attractive the offshoring option becomes for country-1. This is shown in Figure 1 by the following links: CLabor-1 $\rightarrow^{+}$ OpCost-1, CLabor-1 $\rightarrow^{+}$ CL- diff, CLabor-2 $\rightarrow^{+}$ RelCLabor-2, CLaborOther $\rightarrow^{-}$ RelClabor-2, RelCLabor-2 $\rightarrow^{-}$ CL-Diff, CL-diff $\rightarrow^{+}$ Offshoring Rate. These causal links ensure that the CLD of Figure 1 captures the impact of labor rate differentials on offshoring. Note that the labor cost of country-2 is not directly connected to the labor differential CL-diff. Rather, it is first compared to CLaborOther, to yield the relative cost RelCLabor-2, which is then compared to labor rates in country-1 to drive CL-Diff. This indirect comparison is appropriate since, although we are looking at a two-country model, we cannot ignore the fact that there are multiple developing nations to choose from when offshoring. So what country-1 is really looking at is how country-2 compares with other developing countries in terms of labor cost. If country-2 starts to get more expensive than other developing countries, offshored work will flow out of country-2.

Apart from labor rates, the other major factor driving offshoring rate is the availability of qualified labor in country-2. For even if country-2 has low labor rates, it is not an attractive destination for offshoring IT work unless it also has a pool of qualified IT labor. We refer to this aspect of country-2's characteristics as 'sector capital'. It is a combination of the size of the labor pool and its general technical abilities. Clearly, the technical ability of the IT workforce is determined by the quality of education and training in country-2. Moreover, as more and more companies in country-1 seek to offshore – i.e. the offshoring rate increases -, the demand for IT labor in country-2 increases, making the sector more attractive. This draws more workers to the sector and increases the pool of IT labor. The salary level for workers in the offshore IT industry in country-2 is determined by the balance between supply of and demand for IT labor. In countries such as India, the demand for IT labor has soared in recent times, leading to sharp increases in salaries. Some fear that India will ultimately price itself out of the offshoring market because of this trend [18]. In any case, these forces of supply and demand for IT labor in country-2 must be captured properly in order to understand how offshoring is likely to evolve in the future. The effects just mentioned are represented in causal links that appear roughly in the southwest and southeast quadrants of Figure 1. The main causal links follow: Offshoring Rate $\rightarrow^{+}$ LDemand-2, LDemand-2 $\rightarrow^{+}$ Salary-2, LPool-2 $\rightarrow^{-}$ Salary-2, LPool-2 $\rightarrow^{+}$ SectorCapital-2, TrainQual-2 $\rightarrow^{+}$ LFit-2, Salary-2 $\rightarrow^{+}$ Sector attraction-2, RelSector Capital-2 $\rightarrow^{+}$ Offshoring rate.

Figure 1 also contains additional structural components that capture other characteristics of the offshoring phenomenon. For instance, in section 1 we alluded to the fact that the nature of work that is being offshored is changing over time. In particular, more complex business process oriented work is being sent abroad. This changing pattern of offshored work is captured by the link Time $\rightarrow^{+}$ AvgJobCmplx towards the very right hand side in Figure 1. Also notice the negative link CultrGap $\rightarrow^{-}$ RkFit2. This captures the fact that the greater the cultural gap between country 1 and 2, the lower the fitness of the rookie IT workforce in country 2 to carry out offshored work. This cultural difference can take different forms, one of them being unfamiliarity with cultural norms. For instance, even though call center workers in India speak good English, their accent is different and they are not always familiar with different customs that exist in the US or the UK. These kinds of differences can be overcome to some degree through appropriate training. This is captured through the link TrainQual-2 $\rightarrow^{+}$ RkFit2. Figure 1 also captures the political pressures that arise with the offshoring of more and more jobs. This effect is captured through the links Offshoring rate $\rightarrow^{+}$ PressuretoRestrictOff, and Offrestrict $\rightarrow^{-}$ Offshoring rate.

The preceding narrative describes how the CLD of Figure 1 captures the major forces driving offshoring behavior. Notice that there are counteracting feedback loops driving this behavior. As offshoring rates increase, demand for IT labor in country-2 will increase, leading to increasing salaries and a larger workforce. But rising salaries will act to discourage offshoring from country-1 to country-2. In the next section, we simulate this causal model to assess how these counteracting effects may drive offshoring behavior under different scenarios.

4. Computational Experiments

The CLD of Figure 1 was converted to its corresponding collection of differential equations using standard techniques from system dynamics. Some of the variables in Figure 1, such as LPool-2 and SectorCapital-2, are so called stock variables – i.e. they represent accumulations over time. The equations essentially represent differential changes in these stock variables to their respective causes following the causal structure shown in Figure 1. The techniques for building such a system of equations is standard and can be found in any basic system dynamics source [16]. We used the iThink software package to implement this mathematical version of Figure1, which could then be simulated under different parametric conditions. In this section, we report the results of initial simulation runs using this model and discuss some of the implications of these results. Figure 2 shows a baseline simulation run of the model. Note that the simulation period is for 40 quarters, or ten years, and CLabor-1 = 1 throughout the simulation. Also, we have plotted Offshoredjobs in Figure 1, which is simply the cumulative value of Offshoring rate over time. The initial value of CLabor-2 at the start of the simulation is 0.1. These labor cost parameters are meant to approximate the vast salary differentials between the two countries that initiated the offshoring trend. Figure 2 shows how offshoring would evolve, based on the causal structure of Figure 1. The absolute value of offshored jobs on the y-axis is not important since it represents normalized values. Rather, the pattern of the growth curve is what is relevant here. In particular, note how, after rapid initial growth, offshoring growth tapers off in the latter stages. The graph of CLabor-2 shows rapid growth during the firs several quarters, which is consistent with observed IT salary patterns in India. Similarly, the graph of Offshored Jobs shows steady growth for at least twenty quarters. In short, approximately the first half of Figure 2 reproduces observed offshoring and IT salary patterns in India from the recent past. Hence we have some preliminary evidence that the model of Figure 1 may capture the main forces driving the offshoring phenomenon.

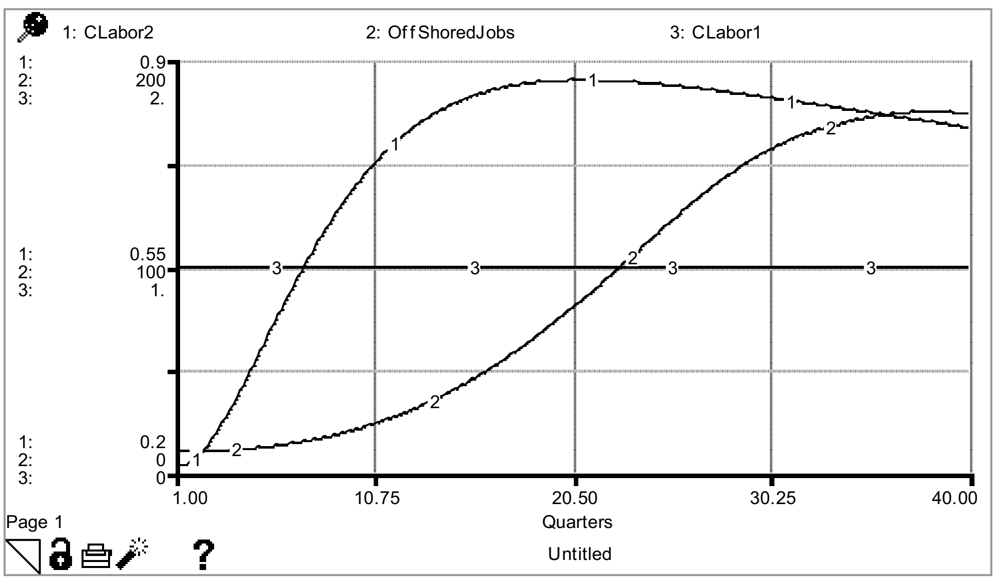


Figure 2. Baseline simulation of offshoring dynamics

Based on this, the second half of Figure 2 appears to tell us that India will indeed price itself out of the offshoring market. At the least, rising salaries will lead to a tapering off of offshoring growth. In fact, we see from Figure 2 that IT salaries in country-2 will stagnate after the strong initial growth. Figure 3 shows three simulation runs showing the sensitivity of offshoring growth to differences in labor quality in country-2. In order, the three runs were for low, medium and high labor quality, respectively. At first, the results of Figure 3 appear counter intuitive, in that high labor skill levels result in lower offshoring growth (run #3). But this is to be expected since higher skill levels will result in higher salaries, which makes country-2 less attractive for offshoring from the standpoint of country-1. The lesson here is not that IT workforce skill levels should be kept low, but that country-2 must lessen its reliance on offshored IT work as worker skill levels improve. In fact, there is some evidence that India is moving in that direction by trying to move up the value chain in terms of the sophistication of IT work that is offshored [14].

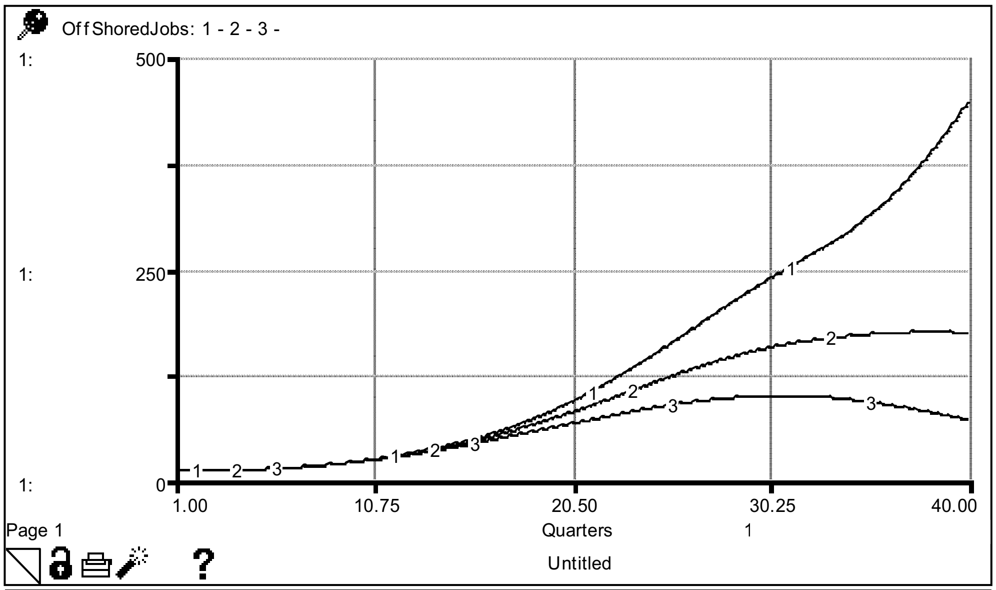


Figure 3. Sensitivity of offshoring growth to IT labor skill levels

These sample simulation runs give a sense of the type of analysis that can be conducted using the system dynamics approach to modeling the forces that drive offshoring activity. In addition to being able to assess the pattern of growth for offshoring activity, the model gives us some insight into what is driving that pattern of behavior, since we can link them back to the feedback loops present in the causal loop diagram of Figure 1. Clearly, the model developed here is preliminary. However, it serves to show the potential of using system dynamics as an approach to studying the offshoring phenomenon. It complements statistical analysis of the phenomenon by examining the causal mechanisms involved. In the concluding section, we summarize planned enhancements for the model, and comments further on the use of such a model for policy formulation and business planning.

5. Concluding Remarks

In this paper, we have used the system dynamics approach to model offshoring growth. The model developed here is for the basic two-country case. This is the fundamental case, since there must be two countries to conduct offshoring. The current model does take into account the effect of other developing countries to which IT work could be offshored. This is done by comparing the labor rates in country-2 to that in other developing countries. Extending the two-country model to the multi country case will not involve alteration of the basic structure. Rather it will involve replication of the causal structure for the other competing developing countries. This does not involve anything different conceptually. That said, even the basic two-country model developed here can be enhanced to make it more comprehensive. For instance, the current model makes no distinction among the different types of IT work that is offshored. It is relatively easier to take a programming project and move it from India to China if India becomes too expensive. It is a lot harder to take a call center activity and move it from India to China, since the latter is part of an ongoing business process. In other words, the dynamics of offshoring IT enabled business processes (the most recent trend) is somewhat different from that of discrete project oriented IT work. Moreover, cost differentials are not the only reason to offshore. Some companies offshore to take advantage of time zone differences and thus essentially get a 24 hour work day from their employees globally. Others offshore in order to be able to focus on core competencies etc. These other modes of offshoring activity need to be incorporated in to the model to make it more comprehensive.

The basic two-country model developed here shows that system dynamics is a viable approach to study how the different drivers of offshoring interact to produce the observed growth patterns. Given the computational nature of the model, it can be used for policy analysis as well as for business planning. Policy makers can use the model to assess the impact of different alternatives, say in the area of education and training. For instance, the upshot of Figure 3 was that introducing policies to produce a highly skilled IT work force is a double edged sword. While it will attract offshoring work from developed countries, in the long term, this may lead to decreased offshoring activity due to rapid salary increases. Hence, technical education policy must be coupled with incentives to develop a domestic IT sector that is not offshore related.

the pool of qualified IT labor, Lpool2, gradually increases and remains steady, while the attractiveness of offshoring as an area of work gradually diminishes over time (see plot#4 in figure 4). Once again, the absolute values are less relevant than the patterns, which provide useful information for policy makers and business planners in country 2. For instance, the predicted stagnation of salary levels and the drop in attractiveness of the sector to new IT recruits has to be of interest for policy. In short, the model can also serve as a decision support tool.

At a conceptual level, by exposing the major feedback loops, the model also helps us understand the mechanics by which offshoring patterns develop. For instance, an observation of the patterns in Figures 2 and 4 shows that, from a two-country perspective, offshoring activity must necessarily reach an equilibrium. This conclusion is supported by the fact the graph of Offshored jobs flattens out towards the end of the simulation run in Figure 2. From a systems theory standpoint, any behavior

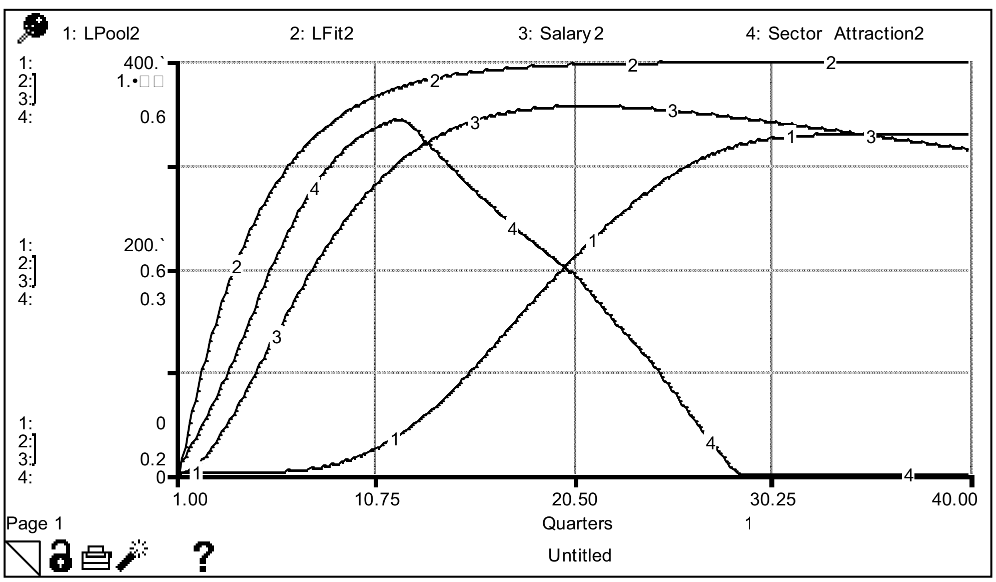


Figure 4. IT sector parameter evolution in Country-2

Figure 4 shows another example of how the model could be used for policy making and planning. It shows how some important parameters of the IT sector change in country-2 as offshoring activity evolves over time. The simulation parameters were kept the same as that in Figure 2 for sake of consistency. These plots in Figure 4 are for variables from the causal loop diagram of Figure 1 that pertain to country 2, i.e. the country to which work is being offshored. Notice the mutual relationships among the variables. Figure 4 shows that over time, salary levels in the offshoring portion of IT sector in coutry-2 experience growth and then stagnation. At the same time,

that tends to a steady state is indicative of the handiwork of some dominant negative feedback loop. Looking back at the causal loop diagram of Figure 1, one can see that one important negative feedback loop in play here is the following one involving salary levels in country 2: Offshoring rate $\rightarrow^{+}$ LDemand-2 $\rightarrow^{+}$ Salary-2 $\rightarrow^{+}$ CLabor-2 $\rightarrow^{+}$ RelCLabor-2 $\rightarrow^{-}$ CLDiff $\rightarrow^{+}$ Offshoring rate. Clearly, this negative loop chokes off offshoring growth towards the latter quarters in the simulation. Likewise, the initial rapid growth in salaries and offshoring jobs evident in Figure 2 can be explained by positive feedback loops, since in systemic parlance, such loops result in unbounded behavior (not indefinitely, but certainly for limited periods of time). In Figure 1, one such positive loop consists of the following links: Offshoring rate $\rightarrow^{+}$ LDemand-2 $\rightarrow^{+}$ Sector Attraction -2 $\rightarrow^{+}$ RkPool-2 $\rightarrow^{+}$ LPool-2 $\rightarrow^{+}$ SectorCapital-2 $\rightarrow^{+}$ RelSectorCapital-2 $\rightarrow^{+}$ Offshoring rate. Such structural information is useful in understanding the mechanisms that drive the dynamics of offshoring. In summary, the system dynamics model can be useful from both a conceptual and applied standpoint.

6. References

[1] Bushko D., "The Coming Revolution: Offshoring, Job Losses and the Activist Consultant," *Consulting to Management*, 15(2), 2004, 3.

[2] Venkatraman N.V., "Offshoring without guilt," *Sloan Management Review*, 45(3), spring 2004, 14.

[3] Gardels N., "Globalization Bites Back," *New Perspectives Quarterly*, 21(2), 2004, 66.

[4] Deloitte & Touche, "Making the Off-Shore Call: the roadmap for communications operators," http://www.deloitte.com/dtt/research/0,2310,cid%3D42002%26pre%3DY%26lid% 3D1%26new%3DU,00.html, March 23, 2004.

[5] Berniker M., "Dell Affirms Commitment to India," InternetNews, Nov 25, 2003, http://www.internetnews.com/ent-news/article.php/3113721

[6] eBusiness Strategies, "Offshore Outsourcing Failure Case Studies," eBusiness Strategies, http://www.ebstrategy.com/Outsourcing/cases/failures.htm, September 2003.

[7] TechNewsWorld, "Re: Dell Recalls Tech support from India after Complaints," Discussion Boards: eCommerce times talkback forum TechnewsWorld, http://www.technewsworld.com/perl/board/mboard.pl?board=ecttalkback&init=1&mview=flat&tview=expanded, June 2004.

[8] Academy of Management, "What Should be Done about the export of Jobs abroad," *Academy of Management Online*, http://www.aomonline.org/ June 2004.

[9] National Conference of State Legislatures, "2004 Legislation Regulating or Prohibiting non US Citizens from State Contracts," http://www.ncsl.org/standcomm/scecon/04LegisECON.htm, May 10, 2004.

[10] Kumara K., "India reacts with dismay to recent US legislation on outsourcing," http://www.wsws.org/articles/2004/mar2004/offs-m16.shtml, 16 March 2004.

[11] Positioning Rajasthan as an attractive location for IT investments, *Government of Rajasthan*, http://rajasthan.gov.in/Rajasthan's%20IT-Policy-2000_files/ Positioning.SHTM 2004

[12] Department of Information Technology and Electronics, "Information Technology Policy – 1999", *Government of Uttar Pradesh*, http://upgov.up.nic.in/infotech/I.T.Policy.htm.

[13] D'Costa A. P., "Software Outsourcing and Development Policy Implications: An Indian Perspective," *International Journal of Technology Management*, 24(7), 2002, 705.

[14] Anderson G., "Outsourcing America," *The World & I*, Washington, 19(1), 2004, 38.

[15]J. W. Forrester, *Industrial Dynamics*, Pegasus Communication, Waltham, MA, 1996.

[16] G. P. Richardson, *Modeling for Management*, Dartmouth Publishing Co., Aldershot, UK, 1996.

[17] Coyle R. (1998) , "The Practice of Systems Dynamics: Milestones, Lessons and Ideas from 30 Years of Experience," *System Dynamics Review,* 14(4), 1998, 343-365.

[18]Yamamoto M., "Will India Price Itself out of Offshore Market?" *Cnet,* http://news.com.com/Will+India+price+itself+out+of+offshore+market%3F/2100-1022_3-5180589.html March 29, 2004.