Information Technology and the Socialist Mode of Production: A Simulation of the Point Allocation System

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Abstract

Many socialist proposals do not take advantage of modern information technology in their theoretical frameworks. This paper presents a new vision of the socialist mode of production in which information technology is used to coordinate the activities of many different consumers and workers' councils. In this proposal, consumers select "use values" from a "General Catalog" and organize them in "needs profiles." Based on consumers' relative valuations of use values, workers' councils are awarded "points," which are used to obtain means of production via a cooperative allocation process.

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Introduction

This paper presents a new vision of the socialist mode of production. It builds on the argument presented in Chapter 7 of my book *Information Technology and Socialist Construction: The End of Capital and the Transition to Socialism* (Routledge, 2014). The primary contribution of this paper is the inclusion of a simulation to show how consumers and workers' councils interact within a needs-based socialist economy. Their interaction leads to the production of a total social product that is consistent with the needs of the population. The production also occurs within collectively owned enterprises where the guiding principle of production, across enterprises and within enterprises, is the cooperative allocation and employment of resources. This vision of the socialist mode of production thus abolishes the distinction between the capitalist class and the working class and eliminates competition among enterprises. In short, it is a classless society.

Part I: The General Framework for Resource Allocation in a Needs-Based Socialist Society

In this section, the features of the point allocation system that are central to the socialist mode of production are specified in detail.[2] Questions related to the transitions from the capitalist mode of production to the socialist mode of production and from the socialist mode of production to the communist mode of production are not addressed here. First, the nature of wealth in the socialist mode of production must be examined. Marx identified the nature of wealth within the capitalist mode of production to be "an immense collection of commodities" at the start of volume 1 of *Capital*. As the reader will recall, Marx took the commodity, which is simultaneously a use value and an exchange value, as his theoretical starting point. Within the

[2] Nearly all the material in this section is an excerpt from Saros (2014: 173-181).

socialist mode of production, on the other hand, wealth consists of an immense collection of use values. The key difference between the types of wealth found within the capitalist and socialist modes of production is that use values within the socialist mode of production are not exchange values, and so they are not commodities. If use values are not commodities, then that means that commodity exchange via the market does not exist. For commodity exchange via the market to have been abolished, most human beings must have achieved a very advanced level of social consciousness. That is, most human beings must have become highly conscious of the way that commodity exchange via the market gives rise to labor-power as a commodity and to capital as an independent social power. Because commodities do not exist, the self-conscious human being must serve as the starting point for the analysis of the socialist mode of production.[i]

A society in which human beings have reached an advanced level of social consciousness acknowledges the value and uniqueness of every individual person. To emphasize the absolute uniqueness of each person in terms of the past, present, and future, each person is to be identified using a unique identification number (i.e., one that is sufficiently long to ensure that it must never be used for any other person). Suppose that the entire global community currently consists of n individuals. A newly born individual is easily accommodated within the system by assigning a new unique number to that person. Similarly, deceased individuals simply have their identification numbers permanently retired. The purpose of the identification number is to allow human beings worldwide to access a socioeconomic interface using modern information technology. Because individuals must consume use values to live and they cannot communicate or satisfy their needs in the marketplace, they require some other method of doing so. As a result, each individual registers his or her needs using a unique profile of needs (i.e., a needs profile) that is accessed electronically.

For the registration of needs, everyone has electronic access to a General Catalog of all existing use values. The j^{th} use value in the General Catalog is denoted u_j. All relevant information for each use value can be accessed through the General Catalog, which includes the physical characteristics of the product or service, the location at which it must be purchased, and the date range during which the purchase must be made to qualify for a special benefit (discussed below). Everyone is free to select any use values from the General Catalog and to arrange them according to preference in his or her needs profile. There is no limit on the quantity of use values that may be included in the profile. Children have needs profiles as well although parents have control of the profiles until their children reach adulthood.

To represent the entire network of needs profiles at a point in time, let N_1, N_2, …, N_n denote the needs profiles of the n individuals currently living. Because each use value is arranged according to preference, a quantitative weight may be assigned to each use value in a given needs profile. The weights are placed in parentheses next to each use value. Table 7.1 shows a simple example of five needs profiles with only a few registered use values.

Table 1: An Example of Five Needs Profiles

N_1	N_2	N_3	N_4	N_5
u_6 (5)	u_3 (5)	u_{11} (5)	u_6 (5)	u_{11} (5)
u_3 (4)	u_6 (4)	u_3 (4)	u_3 (4)	u_{11} (4)
u_9 (3)	u_9 (3)	u_9 (3)	u_{11} (3)	u_6 (3)
u_{11} (2)	u_9 (2)	u_6 (2)	_	u_9 (2)
u_4 (1)	u_{11} (1)	_	_	_

The objection might be made that the weights that have been assigned to specific use values imply cardinal utility. That is, how can it be known that each use value possesses a weight that is only one point above the weight of the use value below it? A related problem arises when we ask how it can be known that the same weight should be assigned to the same entry (e.g., the fourth entry) in two different needs profiles. It must be acknowledged that the numerical values are arbitrary. To these objections, however, several responses can be made. First, it will be made clear that, given how these weights are used, the only assumption of consequence here is the constant difference between the weights. The weights themselves could be scaled up or down without any impact on the economic system. Second, the way in which consumers' relative valuations are expressed in needs profiles allows for expressions that are not so different from the market system, as the simulation shows. Also, it is unreasonable to argue that two different individuals might have extremely different weights assigned to their use values. If we accept that people are not radically different in the way they feel about consumption, then this method of valuation seems reasonable. Furthermore, the needs profiles are structured in a way that ensures that each person's needs are given equal weight in the resource allocation process.

To continue with the representation of the entire network of needs profiles, assume that m is the number of use values on the longest needs profile (i.e., the needs profile with the greatest number of registered use values). The numerical weights in the longest needs profile are then m, m – 1, m – 2, …, 1. For any needs profile, N_j, the numerical weights are m, m – 1, m – 2, …, m – (k_j – 1) where k_j is the number of use values in the N_j profile. The reader can confirm, for example, that the numerical weights for N_3 in Table 1 are 5, 5 – 1 = 4, 5 – 2 = 3, and 5 – (4 – 1) = 2. The term u_{ji} is also used to denote the quantity of u_j in the N_i profile, which may equal the sum of multiple entries if the use value is repeated in the profile. For example, using the

information in Table 1, u_{92} is equal to 2 because u_9 is included twice in the second needs profile. Additionally, U_j refers to the total quantity of u_j for the entire global community (that must be purchased between specific future dates since the date range for purchase is one of the defining characteristics of u_j in the General Catalog). For example, U_9 in Table 7.1 is equal to 5 because the total need that has been registered is for exactly 5 units of the ninth use value. More generally, it is possible to define U_j as in equation 1.

$$U_j = \sum_{i=1}^{n} u_{ji} \quad (1)$$

In addition, p_{ji} denotes the quantity of points assigned to u_j in N_i, which may equal the sum of multiple entries, as is the case with u_{ji} when the use value is repeated multiple times within the same needs profile. Using Table 1, p_{92} equals 3 + 2 = 5 points. Similarly, P_j denotes the total quantity of points assigned to u_j for the entire global community. For example, P_9 in Table 1 is equal to 3 + 3 + 2 + 3 + 2 = 13 points. More generally, it is possible to define P_j as in equation 2.

$$P_j = \sum_{i=1}^{n} p_{ji} \quad (2)$$

These data thus represent the most important information that is extracted from the needs profiles. The purpose of the collection and communication of this information is the next subject to be examined.

Within the socialist mode of production, it is expected that human beings have not yet outgrown their capitalist tendencies. Therefore, most people will continue to require incentives to communicate their needs. Legal restrictions on purchases are not desirable in a socialist society. Without any such restrictions, if an individual fails to register a need in advance, he or she may opt to make the purchase anyway. To provide the individual with an incentive to plan, however,

the individual will receive a bonus that is positively related to the carefulness of his or her planning for the future as implied in the registration of needs and subsequent purchases. Because all purchases are made electronically, the system can easily track the degree to which the purchases of an individual correspond to registered needs. If for some reason, a use value is not available during the period in which it is to be purchased, the system can acknowledge the attempted purchase and not allow the failed purchase to reduce the bonus that the individual receives. Once a use value is placed in a needs profile and the registration period for that use value ends, it will remain in the profile until the use value is purchased or the period during which it is to be purchased ends.

One part of the bonus (the **realization bonus**) that an individual receives each period (e.g., each year) will equal the sum of all the points of the purchased use values for which the individual registered multiplied by a fixed number of credits per point. Credits are the means of payment for use values within the socialist mode of production. It should be noted that the greatest impact on the bonus results from the purchase of one's most highly ranked use values. Also, system administrators determine the fixed number of credits through careful analysis of the level that is required to ensure reasonably careful attention to needs registration. This parameter may be changed assuming it applies equally to all individuals. If an individual fails to purchase use values that were included in the needs profile, then a **non-realization penalty** is assigned. Like the realization bonus, the non-realization penalty is calculated by multiplying by a fixed number of credits per point.

The objection might be made that an individual with a very long needs profile will have the ability to obtain a larger bonus than someone with a shorter profile simply because he or she has more registered needs. A second part to the bonus (the **conservation bonus**), therefore,

considers that some individuals have much shorter needs profiles than other individuals. An individual with a short needs profile puts less strain on communally owned resources and contributes to less working time throughout society. To encourage individuals to limit their needs as much as possible and to prevent unequal treatment of individuals with respect to bonuses, the bonus should be positively related to the gap between the number of registered needs in an individual's profile and the number of registered needs in the longest needs profile. As use values are eliminated from the needs profile, either through purchase or the expiration of the purchase period, many points will not be reassigned to any use value that are assigned in the longest profile. To obtain this part of the bonus, it is only necessary to multiply these points (the cumulative total during the year for an annual bonus) by the fixed number of credits per point. A dual incentive thus exists with respect to the needs profile. Individuals have an incentive to plan for future purchases and an incentive to limit communicated needs. The bonus promotes sustainability without frustration and encourages saving for retirement. Gunn (2011: 325) refers to a "zero-work" reading of Marx: that the true measure of progress over time is that we all work less. This would imply "an expansion of free time for all" and a "different logic for the entire economic system." The encouragement of saving thus helps shorten one's working life and allows for more leisure time.

The collection and communication of information about individual needs is important for the proper functioning of the socialist mode of production. This exercise is useless, however, without a method for producing use values and a means for distributing credit income to those who wish to purchase them. In other words, the traditional economic question as to what must be produced has been answered, but the questions related to how it is to be produced and for whom it is to be produced are not yet fully answered. First, the socialist production of use values

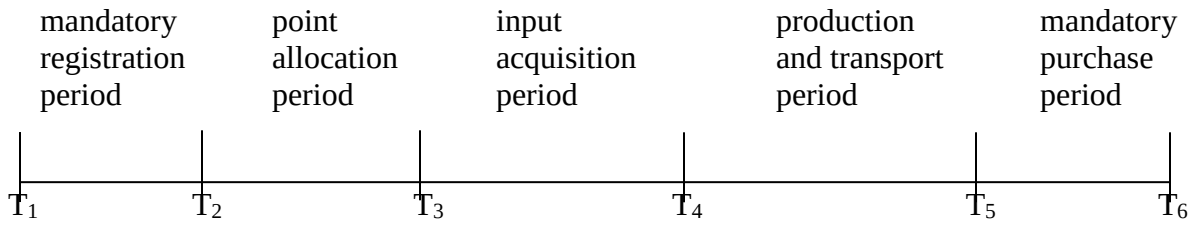
requires cooperative social labor to take full advantage of the social division of labor and the efficiency gains from specialization in production. Workers in a specific workplace, therefore, form workers' councils that make decisions regarding the use values to be produced and posted in the General Catalog. The internal rules governing workers' councils is not important at this stage, and it is enough to state that a democratically elected subcommittee of workers makes these decisions.

To continue with the symbolic representation of the socialist mode of production, the workers' council that posted u_j in the General Catalog receives P_j points, which it then uses to produce and sell U_j units. Again, because u_j specifies the future date range during which the purchase must occur to qualify for a bonus, delivery to the retail outlet must occur by the earliest date and the purchase must be made by the latest date in the range. For example, a use value must be delivered to the retail outlet by June 1 and the same use value must be purchased by August 1 if an individual is to qualify for the realization bonus (unless the use value is no longer available when the individual who registered it as a need attempts to make the purchase). This entire process takes time and so needs must be transformed into points (through needs registration) and use values must be transformed into credits (through the sale of final use values). Just as Marx demonstrated how money becomes capital within the capitalist mode of production, the task here is to demonstrate how needs become points within the socialist mode of production.

To represent the transformation of needs into points and use values into credits, it is necessary to identify distinct time intervals that must exist in every socialist circulation process. Five key periods exist within every socialist circulation process: 1) the mandatory registration period, 2) the point allocation period, 3) the input acquisition period, 4) the production and

transportation period, and 5) the mandatory purchase period. Figure 1 shows how these periods are arranged chronologically.

Figure 1: The Five Phases of Every Socialist Circulation Process



The mandatory registration period refers to the period during which a need must be registered for an individual to qualify for the bonus associated with the later purchase. The point allocation period refers to the period during which workers' councils use their points to obtain the means of production necessary to produce the use values (a process explained shortly). The input acquisition period is the period during which the means of production are being transported to the production facility where production of the use values is to occur. The production and transportation period is the period during which actual production takes place and the finished use values are transported to the retail outlet where they will be sold to the final user. Finally, the mandatory purchase period is the period during which the individual who registered the need must attempt to purchase the use value to qualify for the bonus.

The determination of these periods is central to an understanding of the management of socialist enterprises and the functioning of the point allocation system. The workers' council has some power to determine the lengths of the mandatory registration period, the input acquisition period, the production and transport period, and the mandatory purchase period. The mandatory registration period can be whatever the workers' council prefers. It is in the best interest of the council, however, to make the period long enough that individuals have a chance to consider and

register the use value as a need. Of course, the transportation time required for inputs is to a large extent dependent on distance and transport technology. Still, labor acquisition also occurs during this period (a subject to be discussed shortly) and so the socialist enterprise can extend this period to some extent to allow for the acquisition of additional labor resources. The production and transport period are also under the influence of the workers' council to a considerable extent. The workers' council chooses the method of production and transportation, given the constraints imposed by the social forces of production. Finally, the mandatory purchase period is also to some degree under the influence of the workers' council. The durability of the product and the storage requirements may shorten or lengthen the time that may be permitted for a purchaser to qualify for the bonus.

The one period that the workers' council has no control over is the point allocation period. The system administrators establish the length and timing of this period, and it is uniform across all socialist enterprises. For example, the period may be a period of 24 hours. It is during this period that the points that each workers' council has received are used to cooperatively arrive at an optimal allocation of resources in a process to be discussed shortly. As a single point allocation period ends, another one begins immediately. The chronological arrangement of the periods shown in Figure 1 implies that one socialist enterprise will simultaneously be involved in many such cycles that overlap one another. Under normal conditions, a single enterprise will, therefore, continuously be involved in the activities associated with all the different periods.

All throughout the mandatory registration period, individuals are registering their needs for specific use values. Individuals can add or remove any use values for which a need may be registered during this period. Once the period ends, however, the individual's decision has been made, and the need either has been registered and assigned a specific weight in the profile, or it

is not included at all. At the start of the point allocation period, the workers' council possesses two key pieces of information. It knows the total quantity of use values it must produce and deliver to satisfy the needs of individuals during the specified future period. It also knows the total number of points it has received that permit it to obtain the necessary means of production for accomplishing this task. The question that must be asked is how this information is to be used to achieve the rational socialist economy that Mises argued to be impossible.

Each workers' council has a desired input mix in mind at a specific point in time. It selects these input quantities from the Producers' Section of the General Catalog. This section contains all physical means of production with complete descriptions of their characteristics. Many input suppliers post the use values that they plan to produce in the General Catalog just as producers of final use values have posted their specific use values in the General Catalog. To explain the point allocation process symbolically, it is helpful to remember that a given workers' council knows at the start of the period that it should strive to produce and transport U_j in time for the start of the mandatory purchase period. Assume that the desired input mix to produce one unit of u_j is shown in set 3.

$$\{a_1, a_2, \ldots, a_h\} \quad (3)$$

In this set, a_i represents the quantity of input i that is the desired amount of that input to produce one unit of u_j. Similarly, set 4 represents the desired amount of each input to produce U_j.

$$\{a_1, a_2, \ldots, a_h\} \cdot U_j \quad (4)$$

Consider the request of this workers' council for $a_1 \cdot U_j$. This term represents the optimal quantity for this council. Past production ensures that at least some of input 1 will be available from the supplier. This quantity may be denoted as I_1. The problem is that other workers' councils require the same input. Suppose, for example, that one workers' council has been instructed to produce

U_q and another has been instructed to produce U_r. Suppose further that $b_1 \cdot U_q$ and $c_1 \cdot U_r$ are the desired amounts of input 1 for the two workers' councils. Two possibilities exist. The first possibility is represented in inequality 5.

$$a_1 \cdot U_j + b_1 \cdot U_q + c_1 \cdot U_r \leq I_1 \qquad (5)$$

In this case, the total requirement for input 1 is less than or equal to the amount available. In that case, all workers' councils can have their requirement satisfied exactly, and this information can be communicated to each workers' council immediately. The second possibility is that the total requirement for input 1 exceeds the amount currently available based on past production. In that case, the total quantity required cannot be delivered to the workers' councils. This second possibility is represented in inequality 6.

$$a_1 \cdot U_j + b_1 \cdot U_q + c_1 \cdot U_r > I_1 \qquad (6)$$

The troubling question that arises here is how this scarce input is to be allocated to the various workers' councils in the absence of commodity exchange and the price mechanism to clear the market of a shortage. The answer, which demonstrates the rationality of socialist economy, is calculated as in expression 7.

$$\frac{P_j}{P_j + P_q + P_r} \cdot I_1 \qquad (7)$$

Expression 7 shows the amount of input 1 that will be cooperatively allocated to the producer of u_j at the end of the point allocation period if the producer of u_j takes no further action (a possibility discussed shortly). It is crucial to note that this allocation occurs without any monetary exchange or barter exchange whatsoever. It reflects, plainly and simply, cooperation among bodies of working people.

Many other inputs must be allocated cooperatively, and this process is carried out for each input early in the point allocation period. Once the producer of u_j receives all the information about the available inputs, it is likely that some inputs are available in the optimal quantity, but some inputs are available in suboptimal quantities. Because a specific mix of inputs is required to produce U_j, it is the input that is furthest below its optimal level that determines the quantity of u_j to be produced. Suppose that input 1 is the least available (as a fraction of the total amount requested) of all the inputs required to produce U_j. Further suppose that $\phi \cdot a_1 \cdot U_j$ is the quantity of input 1 that is available where ϕ is a fraction between 0 and 1. In that case, $\phi \cdot U_j$ is all that can be produced, and the producer of u_j should communicate to each supplier its new request for inputs as shown in set 8.

$$\{a_1, a_2, \ldots, a_h\} \cdot \phi \cdot U_j \qquad (8)$$

This new request implies that for nearly all inputs the initial allocation, as determined by calculations such as the one given in expression 7, is higher than the producer of u_j is now willing to accept. This electronic or virtual return of inputs to the suppliers occurs across many enterprises simultaneously. It may be that input 1 is now available in larger quantity than previously. Because greater amounts of many of the inputs are available once again, this new information is communicated to the producers. These excess inputs are allocated using the point allocation mechanism as before. What follows is a period of adjustment or groping towards a stable solution that continues throughout the point allocation period. This process may involve adjustments in the desired input mix as well. Due to the many adjustments that follow, either a stable outcome is reached in which no further adjustments are made, or the period ends, and the input selections are locked into place. In either case, the means of production will have been cooperatively allocated across a variety of socialist enterprises. The specific quantities of each

input that are to be transported to each worker's council during the input acquisition period will be entirely clear.

The producers in this case must interact with their own suppliers in much the same way. The suppliers receive the total points that have been "passed" to them from the final producers. These suppliers then use those points to obtain available inputs and so on. The desired input mixes for these suppliers depend on the demands of those they supply. The point allocation process thus allows those enterprises further along in the supply chain (i.e., those closer to the production of the final use values) to obtain needed inputs for current production, but it also communicates to the suppliers which production levels they should be striving for in terms of future production. This dual role of the point allocation process guarantees the efficient allocation of scarce inputs in the current period and the continuous movement towards accurate production levels even as needs profiles change over time.

It is important to recognize that the points do not serve as a medium of exchange. The points merely communicate information. They cannot be used to purchase commodities as in capitalist societies. At some stage, this process of point allocation and input requests reaches the resource base. That is, requests for raw materials from producers operating in the extractive industries (e.g., minerals, petroleum) are made. Proportional distribution is used in these industries as well as in all other industries to allocate inputs but with one key difference. The difference is that these inputs in their raw, natural form are available in massive quantities and are not the product of any other production process. Excessive depletion of the natural resource base is, therefore, a very great concern. To avoid environmental catastrophe, it is necessary to impose resource consumption limits for a large variety of raw materials in different industries. A Council of Scientists is a special workers' council composed of the world's most highly trained

scientists. These scientists determine the quantities of raw materials in each region that can be sustainably extracted for productive use in industry. These quantities would be regarded as the currently available inputs in the same way as input 1 was treated as such in inequality 5. It is possible that some needs will remain unmet due to the resource consumption limits, but that is the price of protecting future generations from the collapse of the natural environment.

Part II: A Simulation of the Point Allocation System in a Needs-Based Socialist Economy

This section presents a simulation that demonstrates how the point allocation system in a needs-based socialist economy should function. Table 1 shows the initial valuations for each of five consumers. During the registration period, each consumer selects use values and organizes them in a needs profile. Consumer 1 has several gaps in her profile. She expresses her relative valuation of the use values by indicating that u_1 is valued 16 times the second unit of u_5. The gaps in the profile help the consumer indicate how much more some items are preferred than other items. Consumer 2 expresses his relative valuations in a similar way, but the spread between the most valued and the least valued use values is smaller. Hence, the first unit of u_4 has a value of 11 in the profile. The remaining three needs profiles are arranged similarly.

Table 1: Initial Valuations

N1	Use Value	N2	Use Value	N3	Use Value	N4	Use Value	N5	Use Value
16	u1	11	u4	9	u3	13	u5	8	u1
0		10	u3	8	u5	0		0	
0		0		7	u4	0		0	
0		8	u5	6	u2	0		0	
0		0		5	u1	9	u4	4	u2
11	u4	6	u5	4	u3	8	u3	0	
10	u5	5	u4	3	u4	0		0	
0		4	u1	2	u2	6	u2	1	u3
8	u1	0		1	u1	0			
7	u3	0				4	u2		
6		1	u2			0			
0						2	u1		
0						1	u1		
0									
2	u4								
1	u5								

Each consumer has an equal claim to communally owned resources, and so each consumer's needs should be given the same weight. It is thus necessary to adjust each point value upwards in all but the longest needs profile so that those needs profiles have point values that match the longest needs profile. Table 2 shows how this transformation is completed. It is only necessary to add five points to each point value in the second needs profile for example. Seven points are added to each point value in the third needs profile, and so on. This transformation of the data ensures that every consumer's needs are given equal weight in the calculations that follow.

Table 2: Adjustments to Initial Valuations

N1	Use Value	N2	Use Value	N3	Use Value	N4	Use Value	N5	Use Value
16	u1	16	u4	16	u3	16	u5	16	u1
0		15	u3	15	u5	0		0	
0		0		14	u4	0		0	
0		13	u5	13	u2	0		0	
0		0		12	u1	12	u4	12	u2
11	u4	11	u5	11	u3	11	u3	0	
10	u5	10	u4	10	u4	0		0	
0		9	u1	9	u2	9	u2	9	u3
8	u1	0		8	u1	0		0	
7	u3	0		0		7	u2	0	
6		6	u2	0		0		0	
0		0		0		5	u1	0	
0		0		0		4	u1	0	
0		0		0		0		0	
2	u4	0		0		0		0	
1	u5	0		0		0		0	

Before we consider how these points are used to determine the cooperative pattern of resource allocation, we will investigate the determination of bonus income and work income. Table 3 shows how bonus incomes are determined. The conservation bonus is calculated as the product of a fixed number of credits per point and the number of zero values in that needs profile. In this example, the number of credits per point is five and so we multiply each number of zero values by 5 credits to obtain the conservation bonus. The realization bonus is calculated as the product of a fixed number of credits per point and the realization points. The realization points depend on how many of these purchases the consumer executes. If the consumer fails to execute some

purchases during the future mandatory purchase period, then they receive non-realization points and are assigned a non-realization penalty. The non-realization penalty is calculated as the product of a negative number of points and the non-realization points. In Table 3, the realization bonus is calculated as the product of 3 credits per point and the realization points. The non-realization penalty is calculated as the product of -6 credits per point and the non-realization points. When we add the conservation bonus, the realization bonus, and the non-realization penalty, we obtain the net bonus income for the consumer.

Table 3: Net Bonus Incomes

	N1	N2	N3	N4	N5
# of Zero Values	8	9	7	9	13
Conservation Bonus	40	45	35	45	65
Realization Points	44	34	86	43	37
Realization Bonus	132	102	258	129	111
Non-Realization Points	11	46	22	21	0
Non-Realization Penalty	-66	-276	-132	-126	0
Net Bonus Income	106	-129	161	48	176

The income received from the careful construction of needs profiles is only a part of a person's income in this society. People also work and receive work income. Table 4 includes an estimate of the work income of each person. Here we assume that each consumer works for 365 days per year and receives 200 credits per day (as determined by equation 14). Of course, these incomes are not likely to be the same, and we could easily introduce variation here. The annual work income is also an estimate because daily income may change during the year. If we also assume that the point allocation period is 1 day, then we can obtain an estimate of the annual bonus income by multiplying 365 days by the consumer's net bonus income for the day. Again, the annual bonus income is only an estimate because some of the purchases may occur more than a year into the future. In those cases, that part of the realization bonus (or non-realization penalty)

will not be received this year. Adding the estimated annual bonus income and the estimated work income yields the estimated annual total income for an individual.

Table 4: Aggregate Income					
Annual Bonus Income (est.)	38690	-47085	58765	17520	64240
Annual Work Income (est.)	73000	73000	73000	73000	73000
Annual Total Income (est.)	111690	25915	131765	90520	137240

We turn now to the way that points are used to facilitate the cooperative allocation of resources. Let's assume that five workers' councils exist. To determine the points allocated to each worker's council, we simply add the number of points assigned to that use value in Table 2. To calculate the corresponding use value target, we count the number of times it appears in the needs profiles, multiplying the number by 100 to indicate the number of units assumed to be associated with each use value (since the General Catalog identifies a specific quantity for each use value). Table 5 contains these results. The next objective is to determine how many inputs each council receives. To produce their targets, the councils need specific quantities of inputs. Here it is assumed that three inputs are needed in each production process, and the required amounts for each council's production of its use value target are given.

Table 5: Points Allocated to Workers' Councils: Round 1						
	Council 1	**Council 2**	**Council 3**	**Council 4**	**Council 5**	**Total**
Points Allocated	78	56	69	75	66	344
Use Value Target	800	600	600	700	600	
Quantity of Input 1 Required	25	21	16	32	27	121
Allocation of Input (I=92)	20.86	14.98	18.45	20.06	17.65	92.00
Surplus or Deficit	-4.14	-6.02	2.45	-11.94	-9.35	-29.00
Percentage Surplus/Deficit	-16.56%	-28.68%	15.33%	-37.32%	-34.63%	
Quantity of Input 2 Required	15	12	21	17	9	74
Allocation of Input (I=65)	14.74	10.58	13.04	14.17	12.47	65
Surplus or Deficit	-0.26	-1.42	-7.96	-2.83	3.47	-9
Percentage Surplus/Deficit	-1.74%	-11.82%	-37.92%	-16.64%	38.57%	
Quantity of Input 3 Required	14	13	12	15	15	69
Allocation of Input (I=74)	14.00	13.00	12.00	15.00	15.00	69
Surplus or Deficit	0.00	0.00	0.00	0.00	0.00	0
Percentage Surplus/Deficit	0.00%	0.00%	0.00%	0.00%	0.00%	

Each council's productive capabilities may be written as a production function: $U_1 = F_1(I_1, I_2, I_3, L_1)$. That is, use value 1 depends on the required amounts of each of the three inputs, a quantity of labor hours, L_1, and a specific production technology, F_1. Use value 2 depends on the three inputs, a different kind and quantity of labor, L_2, and a different production technology, F_2: $U_2 = F_2(I_1, I_2, I_3, L_2)$. Similar production functions may be written for use values 3-5. The problem facing the workers' councils, however, is that the total amount of inputs available may not be enough to satisfy every council's need for inputs. For example, in Table 5, the five councils require 121 units of input 1 but only 92 units are available. Therefore, the points are used to allocate input 1 across the five councils. Expression (7) shows how to carry out the calculation for each council to obtain the amount of the input allocated to that council. In this way, the total amount available is allocated across the five councils. Input 3 is a special case, however, because the amount of the input available exceeds the requirements of the workers' councils. Hence, each council receives its desired allocation, as shown in Table 5. Table 5 also shows the absolute surpluses or deficits of each input for each worker's council and the percentage surpluses or deficits of each input for each worker's council.

The next step is to recognize that some input deficits are larger than others, which means (assuming fixed proportions production technology) that production must be scaled down based on the largest input deficit facing each worker's council. For example, Table 5 shows that worker's council 1 faces its greatest deficit of input 1 (a deficit of -16.56%). Even though worker's council 1 will be awarded amounts of inputs 2 and 3 that are closer to (or the same as) their required amounts, it will not be able to use more than (approximately) 83.44% of the required amounts of those inputs. Therefore, the worker's council will return, in a virtual sense, the excess inputs for redistribution to other worker's councils. Of course, the other workers' councils operate in a similar way, cooperatively returning inputs that they will not be able to use. Table 6 shows how these adjustments are made. Councils 1, 2, 4, and 5 experience their greatest percentage deficits for input 1. Council 3 is different because its largest percentage deficit is for input 2. Table 6 shows how each input allocation is scaled down to ensure that each council only receives as much of each input as is consistent with its greatest percentage deficit.

Table 6: Points Allocated to Workers' Councils: Round 2 (Adjustment Phase 1)						
	Council 1	**Council 2**	**Council 3**	**Council 4**	**Council 5**	**Total**
Points Allocated	78	56	69	75	66	344
Use Value Target	800	600	600	700	600	
Use Value Outcome	667.53	427.91	372.51	438.77	392.25	
Quantity of Input 1 Required	25	21	16	32	27	121
Allocation of Input (I=92)	20.86	14.98	9.93	20.06	17.65	83.48
Surplus or Deficit	-4.14	-6.02	-6.07	-11.94	-9.35	-37.52
Percentage Surplus/Deficit	-16.56%	-28.68%	-37.92%	-37.32%	-34.63%	
Quantity of Input 2 Required	15	12	21	17	9	74
Allocation of Input (I=65)	12.52	8.56	13.04	10.66	5.88	50.65
Surplus or Deficit	-2.48	-3.44	-7.96	-6.34	-3.12	-23.35
Percentage Surplus/Deficit	-16.56%	-28.68%	-37.92%	-37.32%	-34.63%	
Quantity of Input 3 Required	14	13	12	15	15	69
Allocation of Input (I=74)	11.68	9.27	7.45	9.40	9.81	47.61
Surplus or Deficit	-2.32	-3.73	-4.55	-5.60	-5.19	-21.39
Percentage Surplus/Deficit	-16.56%	-28.68%	-37.92%	-37.32%	-34.63%	

The scaling down of the inputs has a direct impact on the production of use values. That is, the production of use values falls short of the use value targets. The shortfalls are the same as

the shortfalls in each of the workers' council's inputs. Table 6 reveals how this adjustment causes the allocated input quantities to fall short of the total amount of the available inputs. For example, the adjustment leads to an allocation of 83.48 units of input 1, but we know that 92 units are available. Therefore, it is possible to use the point allocation mechanism to redistribute the remainder of the input to the worker's councils. In the case of input 2, 65 units are available, and 50.65 units are allocated to the workers' councils. Again, the remainder can be distributed to the workers' councils. In the case of input 3, 74 units are available but only 47.61 units are allocated to workers' councils. The remainder can be distributed to the workers' councils.

Table 7 shows what happens when these excess input amounts are redistributed to the workers' councils. Table 7 shows how the allocated input amounts rise for each input and for each worker's council. The increases occur, of course, because of the virtual return of inputs due to proportional allocation. The problem that arises is that the proportions in each production process are thrown off as before. Table 7 shows that the largest percentage deficit amounts are now all for input 1 across all five workers' councils. Therefore, production must be scaled down across all inputs for each workers' council as before. It is important to note that these largest percentage deficit amounts are smaller than previously. Comparing the largest percentage deficit amounts in Tables 5 and 7, it should be clear that the virtual return of excess inputs for redistribution using the proportional allocation of inputs has caused a reduction in those deficit amounts. In other words, the process involves a period of groping the aim of which is a stable outcome. This latest adjustment occurs in Table 8.

Table 7: Points Allocated to Workers' Councils: Round 3 (Virtual Return and Redistribution Phase 1)						
	Council 1	Council 2	Council 3	Council 4	Council 5	Total
Points Allocated	78	56	69	75	66	344
Use Value Target	800	600	600	700	600	
Quantity of Input 1 Required	25	21	16	32	27	121
Allocation of Input (I=92)	22.79	16.36	11.64	21.92	19.29	92.00
Surplus or Deficit	-2.21	-4.64	-4.36	-10.08	-7.71	-29.00
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	
Quantity of Input 2 Required	15	12	21	17	9	74
Allocation of Input (I=65)	15.77	10.89	15.92	13.78	8.64	65.00
Surplus or Deficit	0.77	-1.11	-5.08	-3.22	-0.36	-9.00
Percentage Surplus/Deficit	5.13%	-9.22%	-24.21%	-18.92%	-4.04%	
Quantity of Input 3 Required	14	13	12	15	15	69
Allocation of Input (I=74)	17.67	13.57	12.74	15.16	14.87	74.00
Surplus or Deficit	3.67	0.57	0.74	0.16	-0.13	5E+00
Percentage Surplus/Deficit	26.18%	4.36%	6.19%	1.04%	-0.87%	

Table 8 shows the reduced largest percentage deficit amounts for each worker's council. The consequence is an increase in the use value outcomes relative to the use value outcomes in Table 6. Hence, this process moves our needs-based economy towards a superior outcome with the aggregate production of use values rising in the direction of the use value targets. To use neoclassical terminology, this society is moving towards an economically efficient outcome.

Table 8: Points Allocated to Workers' Councils: Round 4 (Adjustment Phase 2)						
	Council 1	Council 2	Council 3	Council 4	Council 5	Total
Points Allocated	78	56	69	75	66	344
Use Value Target	800	600	600	700	600	
Use Value Outcome	729.35	467.53	436.59	479.41	428.57	
Quantity of Input 1 Required	25	21	16	32	27	121
Allocation of Input (I=92)	22.79	16.36	11.64	21.92	19.29	92.00
Surplus or Deficit	-2.21	-4.64	-4.36	-10.08	-7.71	-29.00
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	
Quantity of Input 2 Required	15	12	21	17	9	74
Allocation of Input (I=65)	13.68	9.35	15.28	11.64	6.43	56.38
Surplus or Deficit	-1.32	-2.65	-5.72	-5.36	-2.57	-17.62
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	
Quantity of Input 3 Required	14	13	12	15	15	69
Allocation of Input (I=74)	12.76	10.13	8.73	10.27	10.71	52.61
Surplus or Deficit	-1.24	-2.87	-3.27	-4.73	-4.29	-2E+01
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	

Our next step is to compare the total amounts of inputs that are allocated to the amounts available. Interestingly, 92 units of input 1 are allocated and 92 units are available. That is, the entire amount is allocated. This result occurs because the largest percentage deficit amounts were for input 1 across all five workers' councils. Hence, when production is scaled downward using these percentage deficit amounts, these allocations do not change. Therefore, they are the same as those that occurred during the first redistribution phase as shown in Table 7. Table 8 shows that the other two inputs are allocated across the five workers' councils in such a way that they fall short of the amount available.[3] We can try to redistribute the excess amounts across the workers' councils using the point allocation system. This step leads to the result in Table 9. All the available inputs have been allocated, but the largest percentage deficit amounts still exist for input 1. Furthermore, those input allocations have not changed because no excess amount of input 1 remained for redistribution. Therefore, the percentage deficit amounts for input 1 will determine the degree to which inputs 2 and 3 are scaled down as shown in Table 10. This adjustment causes the input allocations and use value targets to return to the same levels as in Table 8. Therefore, any further applications of this process will lead to the same result as that shown in Table 10. The result shows that the use value outcomes fall short of the use value targets. This shortfall is a direct result of the scarcity of the inputs used in production. Consumers registered needs, and their needs exceeded the amount of resources available to satisfy those needs. Rather than this failure to reach the use value targets representing a weakness, it is a strength. It shows that a needs-based socialist economy possesses a rational method of

[3] Given the fixed proportions production technology, the workers' councils cannot make use of the inputs. It is worth noting, however, that workers' councils could adjust their input requirements to allow for substitution. The assumption of fixed proportions technology is a simplifying assumption to avoid complicating the example.

addressing the problem of scarce resources. It thus represents a direct challenge to neoclassical economists who argue that the market is the only rational method of coping with scarcity.

Table 9: Points Allocated to Workers' Councils: Round 3 (Virtual Return and Redistribution Phase 2)						
	Council 1	**Council 2**	**Council 3**	**Council 4**	**Council 5**	**Total**
Points Allocated	78	56	69	75	66	344
Use Value Target	800	600	600	700	600	
Quantity of Input 1 Required	25	21	16	32	27	121
Allocation of Input (I=92)	22.79	16.36	11.64	21.92	19.29	92.00
Surplus or Deficit	-2.21	-4.64	-4.36	-10.08	-7.71	-29.00
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	-23.97%
Quantity of Input 2 Required	15	12	21	17	9	74
Allocation of Input (I=65)	15.63	10.75	17.01	13.52	8.08	65.00
Surplus or Deficit	0.63	-1.25	-3.99	-3.48	-0.92	-9.00
Percentage Surplus/Deficit	4.20%	-10.38%	-19.00%	-20.46%	-10.19%	-0.56
Quantity of Input 3 Required	14	13	12	15	15	69
Allocation of Input (I=74)	17.61	13.61	13.02	14.94	14.82	74.00
Surplus or Deficit	3.61	0.61	1.02	-0.06	-0.18	5E+00
Percentage Surplus/Deficit	25.81%	4.70%	8.51%	-0.43%	-1.22%	4E-01

Table 10: Points Allocated to Workers' Councils: Round 4 (Adjustment Phase 3)						
	Council 1	**Council 2**	**Council 3**	**Council 4**	**Council 5**	**Total**
Points Allocated	78	56	69	75	66	344
Use Value Target	800	600	600	700	600	
Use Value Outcome	729.35	467.53	436.59	479.41	428.57	
Quantity of Input 1 Required	25	21	16	32	27	121
Allocation of Input (I=92)	22.79	16.36	11.64	21.92	19.29	92.00
Surplus or Deficit	-2.21	-4.64	-4.36	-10.08	-7.71	-29.00
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	
Quantity of Input 2 Required	15	12	21	17	9	74
Allocation of Input (I=65)	13.68	9.35	15.28	11.64	6.43	56.38
Surplus or Deficit	-1.32	-2.65	-5.72	-5.36	-2.57	-17.62
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	
Quantity of Input 3 Required	14	13	12	15	15	69
Allocation of Input (I=74)	12.76	10.13	8.73	10.27	10.71	52.61
Surplus or Deficit	-1.24	-2.87	-3.27	-4.73	-4.29	-2E+01
Percentage Surplus/Deficit	-8.83%	-22.08%	-27.23%	-31.51%	-28.57%	

Given the result in Table 10, we can show the relationship between the use value targets and the desired input mixes, on the one hand, and the use value outcomes and the final input allocations, on the other hand. For example, consider Council 1's production function:

$$U_1 = F_1(I_1, I_2, I_3, L_1)$$

If L_1' represents the amount of labor that will allow Council 1 to produce 800 units of use values (the use value target in this case), then we can write the result for the use value target as follows:

$800 = F_1(25, 15, 14, L_1')$

If L_1'' represents the amount of labor that will allow Council 1 to produce 729.35 units of use values (the use value outcome), then we can write the result for the use value outcome as follows:

$729.35 = F_1(22.79, 13.68, 12.76,\ L_1'') \Leftrightarrow \phi_1(800) = F_1(\phi_1(25),\ \phi_1(15), \phi_1(14), L_1'')$

In this example, ϕ_1 is approximately equal to 0.91169. Similar calculations may be completed for Councils 2-5 to produce the following results: ϕ_2 is approximately equal to 0.77922; ϕ_3 is approximately equal to 0.72766; ϕ_4 is approximately equal to 0.68487; ϕ_5 is approximately equal to 0.71429.

Conclusion

This overview describes the defining characteristics of the socialist mode of production. The legal concept of guardianship indicates that private ownership of the means of production has been abolished. The allocation of means of production using the point allocation system, the distribution of use values via socialist pricing rules, and the distribution of credit income based on accumulated experience, expended effort, and the desirability of work indicate that the market has been abolished. At the same time, it must be emphasized that personal property persists within the socialist mode of production. Once individuals purchase use values, they become owners of those use values and can exclude others from consumption. The consumption of most use values is a private act and so then must the legal relation between the consumer and the use value also be private. It should be clear that a needs-based economy provides new and different answers to the traditional economic questions of what, how, and for whom production occurs, in

a manner consistent with the ethical principle that Marx argued would govern the socialist societies of the future.

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[i] Lebowitz (2010: 13) argues that the real starting point in the establishment of a good society is the full development of human potential. In Lebowitz's view (2010: 21), twentieth century socialism failed to grasp a key component of the socialist vision, which placed human beings at the center.