limited. Yet not infrequently there has occurred a state of so-called "overproduction" in one or more widely consumed lines of commodities. This apparently anomalous state of affairs will be found, upon analysis, to be due not to overproduction as such—not to a simple cessation of demand because of satiated desire—but to a conviction on the part of the consuming public, that *at that price* under existing conditions the commodity in question no longer yields the demanded return for money invested in it. What was formerly exchanged for this commodity now goes elsewhere where the equivalency is considered to be more attractive. Lower your price on this one commodity, however, and see what happens:—the balance of equivalency just established is again disturbed, the commodity now immediately represents a relative increase in return, those articles which before replaced it are now themselves replaced by it, and we get back at least to the original state of demand with possibly an added demand. Continue to lower the price, and this commodity will continue to edge its way into favor, constantly disturbing the balance and in constantly widening circles continuing to replace other articles which we deem, in comparison, as of lesser utility.

It would then seem clear that a simple increase in production without at the same time a decrease in unit cost (and therefore, in the long run, in selling price) cannot of itself in the great majority of cases be considered an economic gain [1] and may at times lead to a direct economic loss—overproduction. Furthermore, a simple increase in production with an accompanying decrease in a cost which, due to inefficiency in management, was hitherto higher than it should reasonably have been as judged by modern standards, may not and usually does not wholly satisfy economic demands. It is only erasing the negative and getting back to par, as it were, but failing to add a plus.

Where the increase in production and the decrease in already satisfactory cost go hand in hand, however, our gain is direct and indisputable.

It was for this reason that the distinction above was drawn, and it is on this ground that scientific management may lay just claim to a more favorable economic judgment than the prevalent increase in production brought about through new equipment which may not be economically justifiable. With its insistence on present efficiency before new equipment is permitted, which with its accurate cost system furnishes a basis for determining the effectiveness of contemplated substitutions, scientific management has a very much firmer foundation upon which to rest its claim. It of course has also the absolute reduction in cost in addition.

Of the various *means* by which scientific management increases production and decreases cost, some—such as the selection, fitting and training of the workers, the reducing of labor turnover, absences, lates, etc., the determining and securing of a proper day's work and the paying of a correspondingly increased wage—are distinct economic gains in themselves. These will be discussed under the human factors. Others, however, must be considered simply as the elements which go to form the most outstanding contribution of scientific management under this head—decreased cost—and as such several merit discussion here.

1. *The Use of Equipment.* Closely connected with the question of new equipment referred to above, is that of the full utilization of that now on hand, using the term in its widest sense to include all facilities of production.

A certain amount of idleness of equipment is of course unavoidable. That it should be even one-half of what it unquestionably is, however, is a striking commentary on the lack of foresightedness of many managements. The encouraging feature about it, however, is that a large proportion of idleness can be prevented and that a few progressive managers are informing themselves and taking effective steps to remedy the evil. Less encouraging is the fact that the extent and seriousness of the losses through idle equipment are seldom appreciated by the manager until it is brought forcibly, even violently, to his attention through cold figures. In comparatively few plants is a record of machine time regularly and systematically kept, and in still fewer instances is the effort made to determine in each case the exact cause of idleness upon which to base intelligent remedies. If, as advocated by Mr. Gantt,[2] each manager could be shown that during the last two months a certain group of machines was idle say 40 per cent of the time, and that this idleness was distributed as follows:

Total Idleness		40 %
Unavoidable breakdowns		3 %
Avoidable breakdowns		12
Lack of work at machines		15
Lack of orders for product	0	
Lack of materials	4	
Unbalanced equipment	6	
Poor planning	5	
Lack of help		10

and if in addition the money loss from each cause could be shown, measures to reduce the idleness would follow almost as a matter of course. Nothing is more common than an abundance of room in what was previously a very much crowded and overburdened department after steps have been taken to balance, rearrange, standardize and maintain equipment, and it is not unusual to hear of a whole contemplated addition to a plant being found entirely unnecessary and consequently abandoned upon the presentation of such statistics as those cited above—a direct saving of usually thousands of dollars, to say nothing of the avoidance of actual loss (through decreased production or increased costs) which many times occurs with an enlargement of plant.

Just why such conditions exist it is hard to say. Attention to such matters should be one of the main duties of the manager. And with a table such as the above, he would soon make them his principal duty. Yet, even under present conditions, it seems so much easier to order new equipment, blame the seller for such slow deliveries that our production is held up, and overlook the fact that by the aid of such facts the way out lies right under our noses. The answer probably lies somewhere between our natural aversion to real thought and planning, and the fact that the prevalent forms of organization keep the manager so hemmed around with ordinary routine that he is left no time in which to conceive and execute manifest reforms. The exception principle in management emphasized by Mr. Taylor, merits a much wider application on the part of most of our executives.

2. *The Use of Labor.* Unlike an idle machine, there is of course no such thing as an absolutely idle man permitted in any plant, yet a man who, before thoro time study and planning might be considered to be extremely busy—as indeed he might be, tho perhaps inefficiently so—in the light of highly systematized working conditions would be thought of as having been previously very ineffectually employed. The term "idle" is becoming a relative one. In general, except as the human element, to be discussed, enters here, the same conditions as pointed out for idle equipment are applicable in this case, and for the present the two may be considered as of like nature and effect. Taken together they constitute the most tangible field for reducing costs.

3. *Material Control.* The stores system in a scientifically managed plant is typical of the minute control designed to be exercised over all departments of the work. It is designed to cover the four factors covering the efficiency of material use: Quality, Quantity, Time, and Cost, and great care is taken to maintain the proper balance between these four interdependent variables so that their resultant effect will be the best for any given case, all things considered.

It is not the purpose of this general review to go into a description of either the methods or the exact results of the various means by which modern management's economic contributions are made. To do so, even for the present topic, would require volumes. Only the broader features can be briefly touched upon. In general it may be said that the principal losses in the materials field occur on the one hand through oversupply, and on the other through undersupply; and curious as it may seem, losses from both sources occur most often in the same plant.

It is the exception where the cost of installation of the stores system does not pay for itself by immediate savings effected, and in many cases these savings arise largely through the elimination of surplus stock and useless varieties, and through effecting a more rapid turnover. In fact, reports as to the amounts of junk disposed of in various plants upon the development of the stores system would be almost unbelievable to one who has not had first hand contact with this work, were it not for the records supporting the statements. Tons and tons of supplies—ordered by the foreman for the expected rush which did not materialize, parts lost or rejected in process, duplicate orders uncaught, "rainy day" and spoiled parts cached by the workman, wrong material delivered and not sent back, parts for discontinued products, and fantastic variations from standard—all accumulate in the storerooms or at various odd places (including valuable working space) throughout the plant, until a detailed study of production requirements leads to a wholesale housecleaning. Immediately and almost invariably, the inventory of stores which it is necessary to keep on hand is de-

[1] I am not considering those rare instances where an increase in production with decreased cost may be an economic *loss* (in the case of whiskey, e. g.), nor where an increase in production even at a decided increase in cost may be a distinct economic *gain* (in the case of food shortage, e. g.). Such cases are altogether exceptional and have no practical bearing on the present discussion.

[2] H. L. Gantt, "Productive Capacity as a Measure of Value of an Industrial Property," Trans. A. S. M. E., 1916.