Value-Based Management as means for increasing effectiveness and efficiency in construction projects

Søren Wandahl

ABSTRACT

In recent years there has been increasing emphasis on the modest productivity development in the construction industry compared to other manufacturing industries. This is the starting point of this paper. It acknowledges that a clear tendency to a poor development is present, but it can be discussed whether productivity is a righteous and objective measurement of development, and especially improvement through holistic management concepts. Efficiency and effectiveness should instead be applied as measurements, and an exploration of these concepts is, therefore, undertaken.

It is argued that a new and more holistic project culture is needed, and, therefore, modified concepts for project management concepts should be explored. Value-Based Management, VBM, is introduced as such an example, and a brief introduction to the underlying principles of VBM is presented.

Finally, a theoretical connection between VBM and efficiency and effectiveness is sought and found. The principal findings are of a theoretical character. Several clear connections between VBM and the increase in efficiency and effectiveness were found. Some of these are: Lucidity of primary the construction client and the end users’ needs and secondary the other participants. This regards both product and process values. Also, the creation of a mutual background for decision-making by establishing shared values for behavior and cooperation.

The originality of this paper is the combination of the work with soft values as means for achieving improved products and the use of effectiveness and efficiency as indicators of development and innovation through the new holistic concepts.

Some of the theories behind this paper present the concept of VBM and methods for measuring improvement thereof. This paper shall, therefore, be seen as a part of the development of a modified project management concept in the new century. These new holistic ideas of utilizing human capabilities should create an effect of positive synergy, which hypothetically could result in more value for all parties, better quality, lower price, higher earnings, more engaged participants and a general raise of the welfare.

KEY WORDS: Productivity, Project Management, Efficiency, Effectiveness, Value, Value-Based Management

1 Ph.D.-student, M.sc., Department of Production, Aalborg University, Fibigerstraede 16, DK 9220 Aalborg East, Denmark, +45 9635 8989, soren@wandahl.net
INTRODUCTION

The classic management concepts assume that the world is rational and predictable, and that it can be managed through rules, control and sanctions. The world of construction projects has lately been described as the opposite, dynamic and chaotic (Baccarini 1996; Bertelsen 2003). The old model of hierarchical control of employees is inadequate for this complexity. A new culture in the building industry is required, in which leaders can develop the personal and professional potential of everyone in the organization (Dolan & Garcia 2002). The concepts of this new culture and related models are still under development, but basic elements such as holistic product development, rapidly changeable organization and focus on human capabilities should be included (Johansen & Kragh-Schmidt 1999).

Value-Based Management could be one example of this new model and culture. It accepts the dynamic and unpredictable nature of construction projects and seeks management through a holistic approach based on human values, commitment, sociologic ideas of group behavior and common basis for decision making. In all, this is a holistic model fundamentally applied through common unchangeable values in the project organization. The well-known structures and systems like finance, time, quality, etc. are fairly the same, but their importance for and impact on the management is eased. They can be changed without any negative impact on the organization because of the common set of values.

An indication of the need for a shift in management philosophies within construction projects could be illustrated by the development of productivity in the building industry.

Figure 1. Labor productivity, value added against total employment (STAN 2003), with 1980 as index-year.

As shown in figure 1, the productivity development in most of the compared countries is modest. There are several reservations to take when concluding on comparative analysis of productivity, but the tendency is clear. Since 1980 the productivity development in the international building industry has not been overwhelming. It is not unrealistic to expect a productivity development of 2% per year, which is a common goal in other industries. This would result in a total development to index 150 over the 20-year period. Only United Kingdom can present such a development.

A discussion of whether productivity is an appropriate measurement for development in the building industry has begun. Several elements add up to this discussion:

2 Such as: Production condition, definition of ‘the building industry’, the use of capital (level of industrialization), inflation, etc.
Firstly, which kind of productivity would be appropriate, i.e. labor, capital, multi factor or total factor productivity? A precise answer is not possible, because it depends on the circumstances and the objective of the measurement.

Secondly, the choices are often limited due to data limitations. Without well-established benchmarking systems, the data source is the national accounts. They gather data through company reports and make statistical tables thereof. The validity of the data is, therefore, questionable.3

Thirdly, is it righteous to expect a yearly productivity increase? The productivity level could reach a maximum due to the definition of productivity itself, and the fact that the western world has worked determinedly for continuous increases since the industrialization began.

Fourthly, a more holistic approach is needed for comprehending new management philosophy ideas.

The conclusion is that productivity does not fully comprise and express the measurement needed and is, therefore, not suitable for measurement of positive improvement through the new culture. Instead, effectiveness and efficiency should be applied. Effectiveness is a measurement for how well the interested parties’ real justified needs are captured and converted into product specifications. The interested parties are not only the construction client, but also the other participants in the construction project, e.g. contractors, consultants, architects, etc. Their needs could be elements such as time, finance, functionality, building materials, cooperation, communication, etc. All together their needs can be described as both product and process values, which will be explained later in this paper. The product specifications are equal to sketches, production drawings, production descriptions, time schedules, etc. Efficiency is a measurement of to which extend the final construction is in agreement with the product specifications, and partly the level of proper used resources connected with the construction.

Another holistic approach for measuring positive changes in the building industry is the establishment of benchmarking systems. Benchmarking can address many elements in e.g. Value-Based Management and prove their positive impact on the building process. Benchmarking systems are already built and partly used in several countries. In the UK they have the "Construction Best Practice Programme" (CBPP 2003) and in Denmark “The Benchmark Centre for the Danish Construction Sector” (BEC 2003a) has recently begun measuring on building projects. This paper will not deal with that topic.

As earlier stated, Value-Based Management, VBM, could be the new model and culture in the building industry. Multiple indications of Value-Based Management’s positive work exist for other manufacturing industries (Blanchard & O’Conner 1997; Jensen 1998), and the challenge is then to adapt and convert Value-Based Management into the framework of the building industry, and especially into the characteristics of temporary project organizations with multiple legal parties. VBM is a concept that can be introduced through several approaches, but a basic set of similarities is applied:

- Soft values as means for achieving better product values.
- Super optimization by focusing on the holistic supply chain.
- Proactivity by measuring the performance.

It is important to understand that the choice is not between traditional hierarchical management and VBM. Instead, a wide “playground” with traditional management as the left border and VBM on the right border is available (Beyer 2000). This playground illustrates the multiple approaches, and in this paper the basic similarities on the right border are outlined.

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3 This is not due the statistical foundation, but concerns more the reports. Companies within the building industry have difficulties themselves gathering the data needed. Partly due to the complexity in the definitions, e.g. how is the output or value added of an action accounted. And partly because of the culture in the building industry no traditions for understanding the important of connecting the data has, e.g. what the reel consumption per hour for a given activity is. Often all this is based on estimates.
RESEARCH TOPICS IN THIS PAPER AND THE PRINCIPLE RESULTS

This paper aims at exploring the connection between the use of Value-Based Management in temporary project organizations with multiple legal parties and its impact on efficiency and effectiveness. VBM is still a new concept in construction and is, therefore, continuously under further development. For more detailed explanations of the concepts of VBM, the reader is advised to seek other literature, such as (Kelly, et al. 2002; BEC 2003c; Wandahl & Bejder 2003). A few practical construction research projects have given bright indications of VBM’s positive effects (BEC 2003c; Bejder & Wandahl 2003), but indisputable evidence is still to be produced.

This paper seeks the theoretical connection between VBM and effectiveness and efficiency. Firstly, the concepts of efficiency, effectiveness and productivity are presented, and a discussion of why productivity measurement is inadequate and why measurement of efficiency and effectiveness is applied instead. Secondly, a brief introduction to the ideas of Value-Based Management is provided. It is then possible to seek the answers to which elements in the theory of VBM that produce positive effects on the above mentioned measurements and how.

The principal results of this paper are partly, an exploration of why productivity is inadequate as indicator for improvements established through application of new holistic project management concepts, especially Value-Based Management, and, therefore, why effectiveness and efficiency could be more appropriate indicators for innovation. Partly, several theoretical connections between Value-Based Management and increase of efficiency and effectiveness are discovered.

THE CONCEPTS OF PRODUCTIVITY, EFFICIENCY AND EFFECTIVENESS

In a technical sense it can be difficult to distinguish between the concepts of productivity, efficiency and effectiveness. This is, however, important for comprehending the possibilities of Value-Based Management. Longman (1995) defines the concepts as follows:

- **Productivity**: “The rate of which goods are produced, and the amount produced, compared with the work, time, and money needed to produce them”.
- **Effectiveness**: “Producing the result that was wanted or intended”.
- **Efficiency**: “The quality of doing something well, without wasting time, money, or energy”.

In the following, a more comprehensive description of the concepts is given with emphasis on why the measurement of productivity is inadequate to describe the benefits of Value-Based Management and on the difference between efficiency and effectiveness.

PRODUCTIVITY

Productivity is often applied as an indicator of innovation and development in an industry and is frequently used in comparative analyses. Furthermore, productivity is often shown in charts with indexes, as in figure 1. Therefore, only progress and not the absolute level can be concluded upon. Cautiousness is also needed when concluding on international comparisons regarding productivity development. Many uncertain aspects occur, like:

- Definition of the building industry, i.e. to which degree manufactures of building materials are involved.
- Different production conditions, traditions and legislation.
- Degree of capital in the industry, automatization and industrialization.
- Comprehensiveness of statistics.

Productivity is generally described as a fraction of production outcome over input. Basically, it describes the value of goods or services of a production over a period of time in proportion to the contribution of production factors. According to the KLEMS model, the production factors are: Capital (K), labor (L), energy (E), materials (M) and services (S) (OECD 2001). Productivity is difficult to measure because outputs and inputs are quite diverse and are hard to measure. Several variants can be applied; in common they all use gross output as numerator. Single factor productivity uses either labor or capital as
denominator, whereas multifactor productivity uses both labor and capital as denominator. Total factor productivity uses all the KLEMS factors as denominator. Labor productivity is the most applied, but even this key indicator differs. Labor can be measured by man-hours, workdays, number engaged, etc.

The choice between the different productivity measurements depends on the purpose and, in many instances, on the availability of data. Since construction is a labor intensive industry, labor productivity is often used. But as construction enters the new century, the whole construction process and the construction methods are getting more and more complex, industrialized and capital heavy. Total factor productivity, therefore, gives a more nuanced and correct measurement of productivity development. Productivity measurements are often carried out on a broken down level, e.g. on formwork (Thomas, et al. 2002). This gives no justification to the holistic approaches, i.e. the effect of positive synergy of "modern management philosophies" such as Lean Construction and Value-Based Management and is, therefore, not recommendable.

In a construction project, several legal parties are involved, but it is not clear how they are entered as input in a productivity measurement (BEC 2003b). Productivity only stresses the importance of producing with a minimum of resources and the capabilities of adding "value" to the product, whereby the price is as high as possible. The main lack, though, is that productivity does not take into consideration whether it is the right product we produce, and furthermore, no indications of who the buyer is, e.g. the construction client or/and the next ring in the supply chain. That is why productivity is inadequate to measure the full potential of VBM, and, therefore, why we should use efficiency and effectiveness as indicators of innovation and development.

EFFICIENCY AND EFFECTIVENESS

A model of interested parties is used to explain the difference between efficiency and effectiveness, see figure 2. Attention is drawn to the fact that the model not only addresses the construction client's needs, but all the interested parties' needs. The interested parties' needs should be perceived widely, i.e. it regards both product and process needs/goals.

The objective of stressing all the interested parties' needs is inspired by the Supply Chain Management philosophy as well as the fact that the building industry is heavily fragmented and that a high level of sub-optimization occurs (Boligministeriet 2000). If this sub-optimization is subject to a change to super-optimization, the holistic view is needed and, thereby, the change from the client view to the view of seeking fulfillment of all the parties' needs. Moreover, the holistic view can cause a positive synergy due to greater consensus on how to solve the job (Nielsen & Kristensen 2002).

Figure 2. Model of interested parties as way of explaining efficiency and effectiveness adapted after Bruzelius & Skärvad (1989).

Figure 2 shows the importance of comprehending the difference between efficiency and effectiveness. Effectiveness is an expression of the level of correspondence of the specifications with the interested parties' needs. Efficiency has two dimensions. Firstly, the achieved specifications are compared with the needed specifications, and secondly, the production of these specifications compared with the level of used resources.

To put the efficiency / effectiveness differentiation into perspective, a model using a product / process viewpoint can be helpful. This is shown in figure 3.
Vertical movements in figure 3 can be perceived as change in efficiency, and horizontal movements could be characterized as effectiveness. “Nirvana” should then be to produce the right product in the right manner, e.g. placed in top-left corner of the figure.

At last in this exploration of the concepts, you may ask what the difference between efficiency and productivity is. In productivity the numerator is the gross output, described in money. Efficiency has instead the specifications of the construction client and also of the other parties as numerator, this gives a more nuanced picture of the production. It is possible to achieve high productivity at the expense of efficiency by obviously avoiding fulfilling the specifications or making errors. The central element in both measurements is, therefore, the use of resources.

A BRIEF INTRODUCTION TO THE CONCEPT OF VALUE AND VALUE-BASED MANAGEMENT

To understand Value-Based Management it is important to be aware of the complexity and the differentiation of the value concept. Value has always been used in construction in one manner or another, but never consistently due to the lack of a common definition of the concept. In most construction projects, values (needs, goals, expectations) are developed and described in the brief, and the achievement of these values is always the primary objective of the construction project. This kind of value is called product value and covers partly market value, i.e. the price for quality in a wide sense and partly utility value, i.e. technical and aesthetic construction and the use of the construction (Wandahl & Bejder 2003). Be aware that price and value are not identical. Value is connected to the product and the process. Price is only an expression for how much the market is willing to pay for the value delivered (BEC 2003c).

But value can be perceived far wider than economics, the physical building, and its use. In everyday life, the term value is often connected with human behavior. Human behavior is more or less consciously influenced by the individual’s values. This kind of value is called ethical/personal value and is very subjective. Ethical value could be explained as an individual bible for what you find good/bad and right/wrong. Covey (1989) explains it very nicely as the paradigm through which you see the world. As construction is labor-intensive, human behavior or human activities plays an important role. Human behavior is often the main part of the process (transforming a product from one state to another), and this kind of value is, therefore, called process value. We now have two groups of value.
The two groups of value have some common characteristics (Fink 2002; BEC 2003c):

- Value is subjective and, therefore, personal. Attributes of value can be objective, but the perception of these is always subjective.
- Value is essentially comparative. Goods do not have any value on their own, only in comparison with others; that is they are relative.
- Value can change over time, and they, thereby, have a time dependent and dynamic element.
- Value is certain forms of characteristics, not substantive quantities. To create value is to create products and processes with certain characteristics.

**THE BASICS OF VALUE-BASED MANAGEMENT**

As most activities in construction involve humans, a need to influence human behavior occurs. There are several areas that influence human behavior, for example: Values, goals, market framework, systems and structures. A model for this is shown in figure 5.

*Figure 5. Behavior regulation in Value-Based Management (Wandahl & Bejder 2003).*

Two kinds of value management can be extracted from figure 5. Management of values primarily uses product values and seeks maximization of the value delivered to the construction client by influencing human behavior via systems and structures. This is known as Value Management as seen in e.g. Lean Construction. When Lean Construction talks about values, it is in connection with removing waste (non-value-adding activities) and increasing the product value for the customer. Management by commonly agreed (shared) values uses process values as a supplementary tool to manage human behavior. This is what some prefer to call management by “soft” areas. Value-Based Management is a combination of these, but with the primary focus on the use of process values as means for creating higher product values (goals).

**FOCUS ON SOFT VALUES. DOES IT WORK?**

There are several elements which contribute to the positive effect that focusing and working with process values (soft values) have on the building process. A project organization has a short lifetime, and the way the organization is established (tendering on lowest price) makes it difficult for the participants to relate to each other on an inter-personal level. In addition, the organization must almost immediately show results. It is, therefore, important to quickly establish a common basis for making decisions. In our rational world this is presently done by rules, laws, contracts, etc. The problem in this respect is that an outcome of a
human action reflects the way you measure it. When the constructing engineer’s success and his future connection to his firm are measured by how much money he can save/earn on short time basis, he will naturally act accordingly, and this is exactly the earlier described sub-optimization. Instead of using laws, contracts, etc. as the common background for making decisions, VBM uses social rules, i.e. behavior regulations on a group level. The real barrier is then to get the firms involved to accept this change, and furthermore, to “walk the talk” (Hauen, et al. 1999). Many of the companies working in the Danish building industry have difficulties earning profit. They, therefore, focus a lot on liquidity, which again creates a short-term focus on only the present project. Development and innovation have, therefore, very hard conditions.

**HOW VBM GAINS HIGHER EFFICIENCY AND EFFECTIVENESS**

Efficiency and effectiveness were defined through three areas, customer needs, product specifications, and use of resources, cf. figure 2. Several theoretical connections between Value-Based Management an increase in efficiency and effectiveness are discovered, and they are best explained through some simple models.

**THE JOHARI WINDOW**

To capture the construction clients needs is often very difficult, both for the construction client himself, but also for the planning and production teams. This is partly because the construction client does not know his requirements, and partly because the requirements will prosper and some will change as the building process progresses, and the construction client and the users, thereby, become more aware of the needs. This situation can be illustrated by the Johari window shown in figure 6.

*Figure 6. The Johari window (Luft 1984).*

The open window should be as large as possible, and this as early as possible in the building process. It is well-known that changes and defects in proportion to the brief will increase the expense of the whole project. In VBM, the open window is increased by clarifying the values of the construction client, e.g. both product and process values, and subsequently also the other parties’ needs. The clarifications of the construction client and the end users’ needs are carried out through dialog concerning discussion, text, pictures, sketches, drawings, etc. Values are an excellent platform for this dialog, and by stressing anti values and wanted values regarding both product and process on workshops, you may also have started creating a team spirit. The difference between the perception of a team and just a formal gathering is cooperation, spirit and commitment. Commitment has two important aspects. Firstly, the agreement / pledge to do something in the future and secondly, the ownership feeling for the construction process and the product.

By enlarging the open window in the Johari model, you directly affect the needs and should, thereby, achieve an increase in effectiveness. In other word, VBM should help produce the right product.
NEURO LINGUISTIC PROGRAMMING

The transformation of the construction client’s and the users’ needs into product specifications is a process, and, thereby, influenced by the process values. The process values influence on this transformation in the design phase, and also the transformation in the building phase, can be illustrated by a model of NLP.

*Figure 7. Logical levels in NLP, and the level of work through VBM. Adapted from Hauen, et al. (1999) and Dilts (1996).*

The NLP-model explains five levels of our personality and is designed so a higher level generally influences a lower level. By influencing the individual’s values, you subsequently influence the capabilities, the operations and the time and place where you execute the tasks. VBM influences the individual beliefs by making them visible, cf. the Johari window, and by measuring and following them up.

This creates a positive effect on the effectiveness because you should gain better agreement between the product specifications and the requirements. The efficiency should also increase because of the influence on the actions, both on the site and in the office, cf. level 1 and 2 in figure 7.

THE PRISONERS’ DILEMMA

The importance of creating a common background for decision-making, and the fact that this background is based on personal values, which unconsciously affect your individual behavior, can be illustrated through a description of the prisoner’s dilemma, which fundamentally is a game theory. This is illustrated in figure 8.

*Figure 8: The prisoner’s dilemma (Axelrod 1986). Effect of strategy is dependent of the other parts strategy.*

<table>
<thead>
<tr>
<th>Part &quot;A&quot;</th>
<th>Strategy</th>
<th>Cooperate</th>
<th>Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>Reward for mutual cooperation</td>
<td>A=3 / B=3</td>
<td>Sucker’s payoff, and temptation to defect</td>
</tr>
<tr>
<td>Defect</td>
<td>Temptation to defect and sucker’s payoff</td>
<td>A=5 / B=0</td>
<td>Punishment for mutual defection</td>
</tr>
</tbody>
</table>

The prisoner’s dilemma is all about dependence. It illustrates that in a mutual situation, the outcome of one party’s choice depends on the other party’s choice. It, furthermore, illustrates the win-win situation, which creates positive synergy. To make the right choice for both parties, a shared set of values is

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4 Neuro Linguistic Programming.
needed, and that is exactly what VBM creates, see figure 2. The interested parties should talk the same language, share the same expectations and all feel commitment for the project in total.

The effect of positive synergy can occur in all phases of the building process, and VBM creates, thereby, an increase in both effectiveness and efficiency.

**DISCUSSION AND CONCLUSION**

This paper takes its starting point in the poor development in productivity within the building industry, and also compared with other manufacturing industries. The tendency of this weak development is acknowledged, but the foundation for using productivity as key indicator of development is questioned. The main reason why productivity is inadequate is that it does not take into consideration whether it is the right product we are building. In other words, it has no connection to the clients’ needs. Other more technical reasons are also given.

Instead, efficiency and effectiveness should be applied as key indicators of innovation and development because they contain the holistic ideas of modern project management concepts. These modern project management concepts are needed for challenging the modest development and progress in the building industry. The contents of these concepts should be elements like holistic product development, fast adaptable structures and focus on human capabilities. It is recognized that Value-Based Management could be an example of such a concept.

Theoretical connections between Value-Based Management and increasing effectiveness and efficiency are explored. Several connections are observed. Primarily clarification of the clients’ needs, but also the transformation of these needs into specifications, and the transformation of the needs into a construction, and the thereby proper use of resources.

**REFERENCES**


BEC (2003b). *Byggeriets nøgletalssystem - dokumentation (Benchmarking of the building industry - documentation)*. Copenhagen, Byggeriets Evaluerings Center.


Bejder, E. and Wandahl, S. (2003). *Partnering combined with Value-Based Management in a building project organization - an action research experiment*. www.wandahl.net/phd


Boligministeriet (2000). *Byggeriets fremtid - fra tradition til innovation (The future of Construction - From tradation to innovation)*. By- og Boligministeriet.


