

SITE OVERHEADS: THE LOST DIMENSION OF IMPROVED PRODUCTIVITY?

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Contractors routinely use site resources, such as site accommodation and fences, but not necessarily in an efficient manner. Often only loosely calculated the costs are accounted for as site overheads. The aim of this paper is to scrutinize these types of costs theoretically; empirically and analytically in the context of a Swedish contractor; and to improve the definition and categorization of these costs. Internationally, in practice and literature, there are many definitions including ‘overheads’ and ‘site preliminaries.’ In Sweden a frequent term is ‘allmänna kostnader’ (AK); i.e., ‘common cost’; which is used by the case company. The study consisted of a literature and documentation analysis; including waste theory and costing methods; interviews; a survey and a qualitative analysis. This helped understand what costs are included in AK. An official company AK definition proved insufficient as employees used it very differently. Managers categorized resources differently from project to project, making comparison and identification of efficiency improvements difficult. A less ambiguous definition and structure of AK; was developed; focusing on the operating cost on-site; rather than any particular activity or zone. Activity-based costing and digital aids such as EquipmentLoop may improve the understanding of costs and allow more accurate estimation.

Keywords: cost categorization; preliminaries; productivity; site overheads

INTRODUCTION

Cost overruns in construction projects are routinely referred to and accepted (Flyvbjerg 2008), but while Flyvbjerg (2008) and others focus on external causes of projects becoming too expensive, other more internal causes are prevalent. Project economy and accounting involves a series of norms, routines, budgeting, and allocating costs in categories, i.e., accounts. Much of these norms and routines could be questioned and redesigned to better reflect the actual cost structure. In doing so it might turn out that norms and routines in company accounting are socially negotiated or even individually set. In fact, contractors routinely use site resources in projects such as site accommodation, fences, overall lightning, scaffolding, storage containers and concrete pumps, placing those under general overheads, as non-account specific, which is not necessarily efficient.

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The objective is therefore to scrutinize common costs theoretically, empirically, and analytically. This is done in the context of a Swedish contractor, a company where managers and employees believed that their common costs have been increasing to unacceptable levels compared with competitors. Therefore, they aimed to reduce these costs. This paper takes some first steps in improving the definition of these costs and categorizing resources.

The paper is structured as follows. It opens with a theory section building on a literature analysis also involving waste theory and costing methods. The theory framing was also supported by a documentation analysis of material from the Swedish construction industry, helping understand what types of costs are included in the term Allmänna Kostnader (AK) or common costs. The method section describes the research design. The empirical side consists of a series of interviews and a questionnaire survey, some of which is presented in the findings. The discussion is a qualitative analysis of this material. The paper finally arrives at some recommendations for future work with AK.

LITERATURE REVIEW

What are AK?

Construction contractors have both direct and indirect costs. Direct costs include things such as materials, labor, and installations (Cilensek 1991). Indirect costs are needed to support the construction of an object but are not incurred by the actual construction (Cilensek 1991). AK are a part of these indirect costs, which may also be known as site overheads, preliminaries, or common costs. The distinction between company overheads and project overheads is also important. AK are included in the project overheads, which Plebankiewicz and Leśniak (2013) describe as costs that the contractor incurs on the construction site that are required to complete the work, but do not include the standard direct costs. Put more simply, they are costs expended to manage and administer a project on site (Nabil and El-Riyati 2015).

Flanagan and Jewell (2018) have developed comprehensive directions for the Chartered Institute of Building (CIOB) for how to deal with unquantifiable items - e.g., preliminaries, overheads and profit. These site-specific costs are ones that cannot be directly allocated to individual activities and a required characteristic of them is that they serve more than one activity (Flanagan and Jewell 2018). However, in practice the distinction is not always clear and resources such as scaffolding may only be related to one activity, such as painting a façade, and may instead be included in the preliminaries due to preferred pricing methods. Flanagan and Jewell (2018) therefore define preliminaries as the cost of running the construction site, rather than any particular activity or zone, which exclude costs associated directly with subcontractor's work.

Flanagan and Jewell (2018: xviii) outline site preliminaries as the following, "management and staff, site establishment, temporary services, security, safety and environmental protection, control and protection, common user mechanical plant, common user temporary works, the maintenance of site records, completion and post-completion requirements, cleaning, fees and charges, sites services and insurances, bonds, guarantees and warranties." Just four of these categories make up around 80% of the total cost for site preliminaries, which are site management (26%), mechanical plant (22%), scaffolding (18%) and site accommodation (12%) (Bowen *et al.*, 1996; Flanagan and Jewell 2018). Overall construction site overheads are between 11-19% of a project's total cost (Bowen *et al.*, 1996). They cannot be arbitrarily lowered as

they are an essential element of the construction project, for example safety standards and resources are non-negotiable.

Why are AK important?

Over the past decade, the Swedish construction sector has flourished with a steady increase in housing production since 2010 (Josephson and Björkman 2010). However, recent reports have started to show a decline, in part due to the new amortization laws in Sweden and increased land prices, which has refocused attention on resource efficiency and competitiveness (Josephson and Björkman 2010; Sveriges Byggindustrier 2020). One common way of increasing competitiveness is to attempt to reduce waste and increase productivity. Josephson and Björkman (2010) found that 10% of resource usage in construction projects is pure waste and that reducing the amount of non-value adding activities may help combat Sweden's high construction costs. These non-value adding activities are wasteful and a reduction of them by following Lean Construction principles leads to improved productivity (Kosekla 2000).

A construction company's competitiveness is often measured by their bid price for a project and as competitiveness has increased in the sector this creates pressure for construction companies to cut bids to reach desired profit levels, which results in increased risk for the organization (Chao and Liaw 2017). Managers sometimes try to achieve this by reducing the budget for site overheads as it is one of the most wasteful and fastest growing cost categories (Siskina and Apanaviciene 2009). This occurs due to difficulties and uncertainties estimating project overheads and many contractors do not know nor can define their actual site overhead costs (Siskina and Apanaviciene 2009). The result is significantly lower levels of accuracy achieved compared to estimating direct costs in construction projects, which transfers risk onto the construction company (Chan and Pasquire 2006).

How is AK calculated?

In theory is claimed by Chan and Pasquire (2006) that overheads are thoroughly calculated, but in practice it is the estimator's experience, intuition, and professional judgement that largely determine the final sum. It is common that indirect costs are not calculated in detail as it is difficult to do, instead they are estimated as a percentage of direct costs to save time (Chao and Liaw 2017; Nabil and El-Riyati 2015; Plebankiewicz and Leśniak 2013). Estimators use their experience based on criteria such as historical project data, competitive conditions, levels of risk and size and nature of the project when attempting to predict site overheads (Nabil and El-Riyati 2015). In projects where site overheads are calculated in detail, companies often price overhead items twice to ensure that resources are not forgotten about, others deliberately neglect items in order to lower their bid price (Wilmot-Smith 2006).

Activity Based Costing

Traditional accounting methods implemented by contractors fail to accurately address site overhead cost allocation in projects, hence also failing to manage them (Al-Hajj and Zaher 2012; Kumar and Mahto 2013). The overhead cost management system should provide accurate costing so that losses and gains related to cost objects can be identified and contribute to a reduction of overall project costs (Kim 2017). Kim (2017: 16) addresses traditional costing as 'one-stage costing' where all products or services consume resources directly and therefore the cost allocation to overheads

becomes based purely on direct hours or direct labor costs, which limits the ability to readily identify the drivers behind them.

Activity Based Costing (ABC) addresses the issues with traditional accounting by instead assigning activity costs to cost objects in proportion to how much of the cost object the activity consumes, which results in more accurate cost information (Kim 2017; Kumar and Mahto 2013). ABC allows organizations to easier identify which activities are wasteful and which activities are adding value and more accurately allocates overhead costs to cost objects (Alsayegh 2020; Kim 2017; Kumar and Mahto 2013). The benefits entailed by ABC over traditional accounting often bring increased profit and increased competitiveness (Alsayegh 2020).

METHOD

Literature surrounding the term 'allmänna kostnader' is scarce as it is primarily a term used by the case study company. A literature and document review of similar terms that are used internationally was conducted, such as 'site overheads', 'general conditions costs' and 'site preliminaries'. Sources were identified predominantly by using online searches in Google Scholar and through a university library. The aim was to gain an understanding of these types of costs, what they are, how they are defined, and which resources are included. The literature study also included a review into activity-based costing in construction as a potential solution to the problems faced by the contractor.

The case study was conducted with a large Swedish contractor mainly working with housing construction. Eleven semi-structured face-to-face interviews ranging from 40 to 120 minutes were conducted with both office and site employees, across three different districts from the case company. The interviews consisted of 21 standard open-ended questions that were tweaked depending on the role of the interviewee (primarily estimators and site managers). These questions were developed by firstly performing a series of preliminary interviews with six key people within the organization. An online questionnaire survey with 18 questions was sent to 95 employees from two districts with a response rate of 52%. The purpose of this was to understand the views of a greater number of workers, whilst gaining a deeper understanding of some of the ambiguities that arose during the interviews.

An abductive reasoning approach was adopted to synthesize and analyze understandings gained from the literature review and case study results by having an iterative process, which guided the authors in identifying important aspects and insights during the research process (Dubois and Gadde 2002).

FINDINGS

The notion amongst all the interviewees was that AK are present in their everyday work and they are an important aspect of achieving a successful project. AK were often referenced as costs for physical objects (e.g., equipment, material, and machines) or recourses (e.g., services) necessary to conduct the work safely and soundly. However, none of the interviewees seemed to know exactly which objects or costs AK entails. Estimating Manager 2 explained that “you need to use a mix of guessing and thorough calculations when estimating AK.” This ambiguity was prevalent amongst all the interviewees when asked about their experience working with AK. Estimating Managers 1 and 2 explained that the problem starts with inefficiency at the sites when site managers are not always thorough in their choice of work method. Two examples given were the inefficient use of tower cranes and site

accommodation. In some instances, tower cranes are moved around the site when instead a more efficient method would be to return it and hire a mobile crane for the remaining lifts. Renting site accommodation is expensive and despite this, site managers tend to rent the same sized accommodation throughout the whole project even though the occupancy rate changes. Another problem was incoherent cost management in projects as site managers report their costs in their preferred manner. Estimating Manager 1 explained that inconsistency in cost allocation practices makes it difficult to obtain any reliable data for future estimations.

Two of the five interviewed site managers explained that they calculate AK based on the percentage that is given to them from the estimators when starting a project. Although how estimators calculate the percentage and whether it is a high or low percentage is not always understood by the site managers. Site Manager 1 claimed that sometimes estimators calculated AK too high, so they lower the budget by 2%, even though nothing in the project has changed. Site Manager 2 explained that they were previously asked to use scorecards and set a percentage goal for AK themselves in their projects. The same site manager then continued stating the following while explaining what reporting to the superiors looks like, “they sometimes ask us how many percentage points we have lowered AK by, and I just shrug my shoulders. We just filled out the form” (Site Manager 2).

Site Manager 1 said that every project has its prerequisites, and as long they are within the provided percentage limit once the project finishes it does not matter how the costs were allocated. Site Manager 2 said that it is problematic when no defined guidelines exist for AK, consequently making ineffective work methods inevitable. The same site manager continued to explain that everyone has a responsibility in a project. This means that it is not necessary to differentiate between costs as long you are meticulous with all costs related to the project. The Site Supervisor said that it is easy to be lazy about AK and it is often forgotten in the daily work.

Even if all the interviewees did not consider themselves knowledgeable about AK, they knew the concept and perceived it as important. In some of the interviews, employees regarded themselves as knowledgeable about AK but when asked to define and explain it they had difficulties explaining exactly what it is or how it should be managed. Thus, all the interviewees defined AK differently. The same pattern was revealed by the questionnaire respondents as 80% believed that it is important to lower AK and that they could accurately define AK. “To understand AK is crucial if we want to lower project costs and be able to see which projects managed to keep their AK low” (Questionnaire respondent).

Ten out of eleven interviewees stated their definition of AK is based on their own experiences as well as influence from their co-worker’s perception of common practice when working with AK. This was shared with the respondents in the questionnaire as 61% answered that their definition derives from estimators or colleagues. Estimating Manager 1 explained that a definition of AK accompanied by a list of “AK-resources” already existed in a PowerPoint within the company. Even though an official AK definition existed, none of the other interviewees used that definition when asked to explain AK. A similar pattern was discovered in the questionnaire when respondents were asked to state which definition they agreed with the most. The results showed that most people agreed with the definition derived from the reviewed literature and not with the one provided by the company.

The survey respondents had a modest view towards reducing costs in projects. They answered that company culture, attitudes of people, inadequate communication, the internal rental company, and other reasons to be obstacles in reducing AK. One of the respondents wrote that communication with estimating managers was a prevalent obstacle for lowering AK.

Amongst the interviewees, Site Manager 2 and 4 expressed a lack of understanding and communication as obstacles. They believed that it was key to involve everyone through allocating responsibility down the hierarchical structure within projects. By making site supervisors aware and responsible for intricate parts of the projects they would become more engaged in understanding costs as it would directly affect their performance. Thus, the delegation of responsibility makes employees thoughtful about cost and work methods. Site Manager 2 did not differentiate between AK and other costs in projects. They saw no reason for the categorization of resources, rather they believed in optimization of every resource. According to them, it is the final cost of the project that matters, period.

One meticulous logistics engineer was notorious for being efficient with AK. By using sophisticated spreadsheets and documentation a bank of historical data was created. This enabled accurate AK predictions in future projects. However, the Logistics Engineer still added 10% to the AK budget as a precautionary measure. The method was not used by the other interviewees as the logistics engineer had adopted this from another district within the company. Finally, at the time of this research, a digital tool was being tested in two pilot projects. The tool "EquipmentLoop" (EL) is an app that site managers and supervisors use to keep track of selected equipment like handheld power tools or scaffolding. They received push notifications when it was time to send equipment back, thus avoiding having unused resources laying around costing money. The app was still under development and future versions will include more equipment, rental services, assigning of resources to a specific person, and price comparison amongst vendors. Nonetheless, EL was praised for creating awareness amongst employees and Site Manager 4 claimed that the costs had been lowered since implementing EL.

DISCUSSION

The investigation rather clearly showed that the employees used their own definition and categorization which varied among them. However, as one estimating manager accounted for there already existed a PowerPoint presentation, which defined AK and gave a general categorization. Yet, the interviews showed that the interviewees were unaware of it. Employees will likely continue to use their own methods and beliefs, which makes lowering AK a strenuous task. Apparently, the individual employee asserted that a clear personal categorization made their work easier. Without a standard method of working, it is difficult for estimating managers to follow-up costs and update their experience values for future cost predictions. A standard practice would benefit the company in terms of saving money and increasing competitiveness as interviewees revealed different management methods in use.

Many of the interviewees mentioned larger machines when asked how they defined AK. Crane usage management was brought up as a key factor that determined if a project ends up with a high or low AK. Estimating Manager 2 provided an example that describes the importance of managing large machinery by advocating an 80/20 tactic. In other words, position the most expensive crane where you will work 80% of the time and use a mobile crane for the remaining 20%. This indicates that large

machinery is often calculated based on time and the concept of waste becomes a relevant aspect to mitigate costs concerning the mechanical plant (Josephson and Björkman 2013). The examples underline the “rule of thumb” character of the individual categorizations used since managers rely on intuition and professional judgment in the absence of a definition (Chan and Pasquire 2006).

The problem was amplified from the prevailing discrepancy in communication between on-site employees (e.g., site managers and site supervisors) and off-site employees (e.g., estimating managers and estimators). The individual appropriation of categories also involved collapsing other project costs with AK. Two site managers did not like the idea of separating overhead costs from other costs. Instead, they argued that every project has a certain amount of resources that need to be optimized as much as possible. This ambiguity is expected when managers find it troublesome to define their costs (Siskina and Apanaviciene 2009). It was the author's understanding when commencing the study that the main AK issue at the company was cost and resource allocation, but it was found no standard understanding of AK existed. Without an explicit definition for AK managers will continue to allocate resources based on their own preference. Therefore, the findings imply that the first step necessary is for the company to agree upon a definition that is communicated, understood, and accepted. It is proposed that the definition from the CIOB literature is adopted since employees found it most relevant and to form this understanding around the ambitions for more efficient cost accounting at the case company.

The dynamics of AK

AK was interpreted as having a link to the general societal economic development. In Sweden in 2017 new amortization demands affected buyers' purchasing power and affected all types of properties. The interviewees suggested caution and claimed that the company were feeling the effects of the change to amortization payments in a negative way. The company's net-profits were approximately 3% for the last 10 years, which leaves little room for manoeuvring if market conditions change. This has led to an increased focus on cost even though as one site manager described, they learn a lot from trial and error. They lack a working manual, and the estimating managers struggle with the inconsistent cost management practices of site managers. The costly practices of learning by trial and error and difficulties conducting follow-up studies due to poor practice indicate significant opportunities for improvement.

According to Josephson and Björkman (2010), 10% of resource usage in a construction project is pure waste and a company's competitiveness is based on how efficiently they manage their resources. Waste is defined as anything that is not contributing value to the customer. Therefore, it should be in both the company's interest and the customer to improve effectivity by managing their resources more efficiently. Swedish construction costs remain high, and a lot can be done to become more effective by reducing the amount of non-value adding activities in projects (Josephson and Björkman 2010).

Tools and methods for handling AK

One should maybe expect a well-established set of standard tools and methods but Estimating Manager 2's communication appears general when they said that through experience, they understand the process and solve tasks with a mix of guessing and thorough calculations. It can be derived that detailed calculations of overheads or preliminaries are often unfavoured, instead, they are calculated by taking a percentage of the direct costs, often relying on the experience of the estimating manager to make

reliable calculations. It is a time consuming and inexact task. Chan and Pasquire (2006) support these claims by noting that site overheads are prepared through thorough calculations, but it is the estimating manager's judgement that most strongly impacts the final sum.

During the interviews, there are similar narratives to that of Estimating Manager 2 from both on-site and office roles where the Site Supervisor says things are often missed and the Logistics Engineer describing adding 10% to the AK budget for items forgotten about. The result of this is depicted well by Site Manager 2, who says that with no defined guidelines, ineffective work methods occur frequently. They also criticized AK as a percentage, especially when referring to scorecards as they do not say what is included, which makes them irrelevant.

When submitting a tender, companies are often under pressure to cut their bid price to win the contract. This may mean that companies accept lower profit margins, aim to reduce costs, and accept more risk. Estimating managers use their experience based on historical data, market conditions, risk, size, and nature of the project, etc. to predict the final cost. To try and increase experience levels Site Manager 4 liked to give site supervisors responsibility over smaller project tasks. The manager mentioned that this often resulted in an increased focus on costs as supervisors had to choose between different work methods themselves. Although still being tested at the time of the study, EL was highly regarded amongst the employees with access. They found it helped reduce waste by giving them a better overview of resources, which enabled them to work more efficiently. Others without access were sceptical due to the added costs taken on by the project to use the software. However, in the test projects, it was found that the benefits far outweighed the expense. As previously mentioned, AK efficiency at the company suffers from inconsistent cost accounting practices. EL gave managers a more direct overview of their practices, which also seemed more valuable to them than receiving directions from management. Furthermore, EL could be used to provide the feedback data sought for by the interviewed estimating managers and potentially reduce tensions that exist between office and site roles. It is proposed that EL is rolled out to more construction sites and to study the resulting effects on AK.

It is the authors understanding from the interviews that nothing can replace first-hand experience with AK. Many people felt confident defining AK and in their own work methods. They felt this even though they knew most people worked differently with AK to them and received different definitions from different sources. Employees have their individual understanding of AK but if the company wishes to work more effectively with these costs, they must redefine the term for employees and categorize its elements. Moving away from the current one-stage costing towards ABC may further help this transition towards effectivity by clarifying the importance and drivers behind costs in projects (Kim, 2017; Kumar and Mahto 2013). Costs are allocated based on activities rather than arbitrary constraints such as square meters, which is easier for managers to interpret. Furthermore, the structure of ABC would potentially make information about costs easier to communicate as it prices specific activities instead of projects (Stášová 2019). Thus, revealing a potential for avoiding prevailing ambiguity between site managers and estimating managers. Existing frameworks e.g., Kim (2017) can be used as a reference for implementing ABC.

CONCLUSIONS

This paper aimed at scrutinizing site overheads / AK theoretically, empirically and analytically. This is done in the context of a company where managers and employees believed that their AK have been increasing to unacceptable levels compared with competitors. Therefore, they aimed at reducing these costs.

The study's main contribution is to highlight the lack of a consistent understanding for site overheads in practice. It was clearly shown that the employees used their own definition and categorization, which varied amongst them even though it was assumed that everyone at the company worked in the same way. There is also no consistent definition in the literature. Therefore, the author's position is that implementing and following through with a standard definition (e.g., CIOB's as company workers connected well with this rather than any currently in use), work method and categorization for AK would increase consistent practices between projects. Furthermore, the divide between office and site roles needs to narrow to be able to use these practices to work more efficiently and more accurately predict AK in projects.

The dynamics of AK were interpreted as having a link to the general societal economic development. AK was scrutinized by the case company due to increased competition but due to inconsistencies shown in combating these rising costs, it is questioned whether the case company is incentivized enough to adapt, as they are currently performing well in the market. The study showed that there is the possibility for a reduction in wasteful non-value adding activities by eliminating practices such as on-site trial and error.

With ineffective work methods and no defined guidelines estimators and site managers relied on personal judgement when working with AK, with margins built-in for resources that are simply forgotten about. The company may wish to standardize AK working practices and inform employees to enable them to work more effectively with these costs. ABC and digital aids such as EquipmentLoop were well received as potential solutions to these problems.

This study is limited to one department of one case company. Future research could use more data, including that from the small-medium sized firms that the case company is struggling to compete with. A more in-depth approach could be taken to the categorization of AK resources as a basis for analysis between projects. Furthermore, the effect of digital tools such as EquipmentLoop on lowering costs could be investigated.

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