The cost we don't discuss,

Crime in the Construction Industry

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Abstract

Almost everyone who works in the construction industry has anecdotes of theft or fraud which they have encountered or heard about. Crime in construction is, of course, a covert activity, so it is difficult to find data which gives a clear picture of how big a problem crime may be. Many crimes go undetected. And even those which are discovered, many may not be prosecuted, simply to avoid bad publicity. What this paper seeks to do is explore the scale of the problem of crime in construction, examine why the construction industry is so susceptible to crime and provide a practical guide to the identification of common construction crimes. In particular, this paper explores practical ways crime can be detected, to allow practitioners in the construction industry avoid becoming victims of crime.

The role of technology is examined in detecting and preventing crime on sites. This includes:

- The use of CCTV to prevent theft and unauthorized access.
- The use of computerized site entry systems to provide accurate records of people on site.
- The use of AI in detecting collusion in bid documents.
- The use of GPS tracking in plant fleets and AI analysis of plant movements to prevent misuse of plant and materials.
- The use of survey drones to check the quantities of remeasured materials.

Crime detection is examined both contemporaneously, whilst it may be happening and forensically after the project may have been completed. The different measures which can be taken at each stage are discussed.

As all costs of crime in construction are detrimental to already very thin profit margins, crime is therefore an issue warranting serious attention. But law enforcement agencies have also expressed the view that crime in construction is often concealed in a "grey zone", with costs bundled into claims for delay and disruption. Such claims are often submissions which many of the readers of this paper are familiar with or may prepare and develop in their professional lives. The Writer argues that construction practitioners working on the development of such claims have an ethical duty to check for evidence of crime, to ensure that they are not, unwittingly, taking part in a cover-up of crimes to the detriment of our ultimate employers. In addition if a crime can be proven then the cost of that crime is usually covered by the contractor's all-risk insurance policy which may provide an avenue for cost recovery.

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1. Definitions

In any examination of crime in the construction industry it is important to have a common understanding of the terminology. Firstly, crime is an all-encompassing word which includes all actions punishable by law. The FBI National Incident Based Reporting system (NIBRS) splits crime into three categories, crime against persons, crimes against society and crimes against property. All of the crimes considered in this paper fall under crimes against property.

Virtually all crimes against property are a form of theft. The official definition of theft, within United Kingdom legislation, is "dishonestly appropriating property belonging to another, with the intention of permanently depriving the other of it" [1, p.27]. This definition is so broad that the most common crimes in construction (stealing, fraud, conspiracy and collusion) would all fall within it. This classification of crime is illustrated in the following figure:

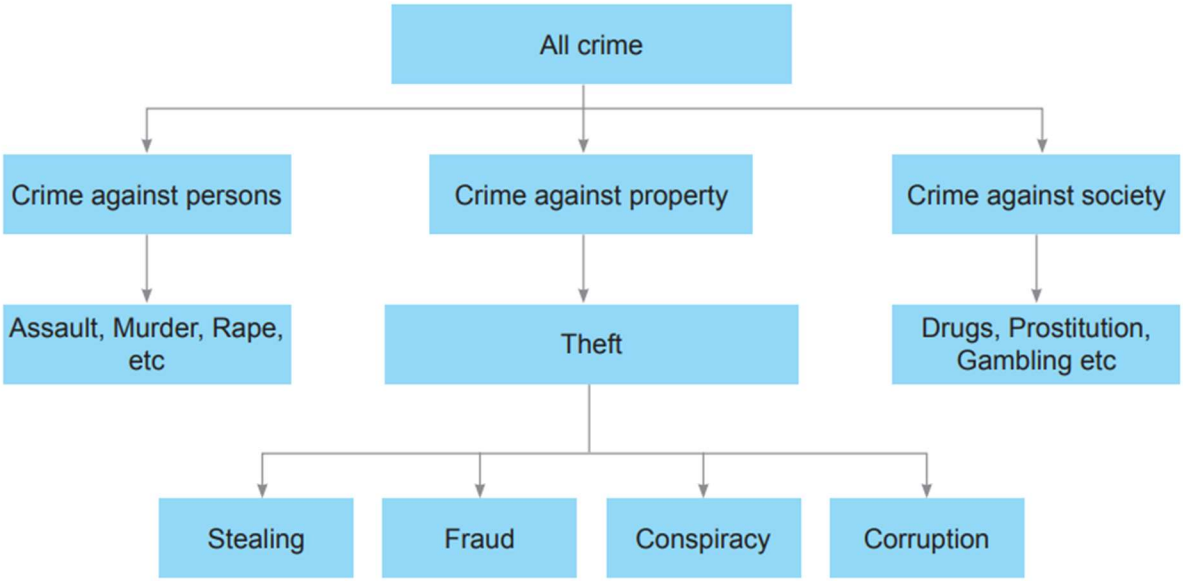

Figure 1 – Classification of crime

Definitions of the four most common specific crimes in construction are provided in the following sections. For the purposes of this report let us use three characters called Andy, Brian and Colin to illustrate our points.

1.1 Stealing

Stealing is primarily an opportunistic crime. To take an example from a construction project, Andy sees Brian's laptop in an unlocked office, sees that no-one is watching it and takes it away. Brian returns later to find that his laptop is gone and can do nothing but report it missing to Colin – the security guard who determines that it has been stolen.

1.2 Fraud

Fraud is theft by deception. Fraud is defined as "dishonestly obtaining a benefit or causing loss, by deception, false representation or an abuse of power" [2 p.27] . Fraud is therefore a more brazen crime than stealing is. In our hypothetical case study, Andy sees Brian working on his laptop. Andy manages to convince Brian that he is from the IT department, and he has to take the computer away for an update. Brian allows the computer to be taken but then

after time passes becomes concerned when the laptop isn't returned. Brian reports the laptop missing to Colin, who finds that no IT update was scheduled, and that the computer has therefore been stolen.

1.3 Conspiracy

Conspiracy is where a number of individuals collaborate to commit a fraud. Conspiracy is defined as having taken place, "if a person agrees with any other person or persons that a course of conduct shall be pursued which will necessarily amount to or involve the commission of any offence or offences by one or more of the parties to the agreement" [3, p.27]. In our theoretical example, Andy and Colin have both decided to steal Brian's computer. Colin is able to let Andy into the office, as Colin has the keys. Colin is also able to turn off the security cameras, whilst Andy steals the computer. When Brian finds the computer stolen, Colin says he can't remember seeing any computer in the office, suggesting to Brian that he must have lost it somewhere else. The computer is therefore never reported stolen but has clearly gone.

1.4 Corruption

Corruption is defined as "*a form of dishonesty or a criminal offense that is undertaken by a person or an organization that is entrusted in a position of authority who acts to acquire illicit benefits or abuse power for one's gain. Corruption may involve activities like bribery, peddling of influence and embezzlement, as well as practices that may be legal in many countries, such as lobbying. Political corruption in particular occurs when an office-holder or other governmental employee acts in an official capacity for personal gain*." [4, p.28] In our hypothetical case, Andy is in a position of authority and simply demands the computer from Brian. Andy then threatens Brian that if he tells Colin about the loss of the laptop, Brian will lose his job.

Our examples above look only at the simple act of theft of a physical object. However, theft can be much more complex, as we will examine in later sections of this paper. A conspiracy is more significant than a theft or a theft by fraud because in a conspiracy the measures put in place to prevent loss are subverted and the fraud can happen time and time again...

2. Introduction

In this section we explore three questions, why should we be concerned with this issue? Who are the victims of the crime? And how big of a problem is this in the industry?

2.1 Why is this issue of concern?

The readers of this paper are assumed to be predominantly contractors, employers, lawyers and claims consultants working within the construction industry. A reasonable question to ask at the outset of this report is why we should be interested in this subject? Isn't crime simply a matter for the police, or criminologists? Pondering on this, the New York Organised Crime Task Force made the following statement [5, p.27]:

"*The line between criminal fraud and non-criminal waste is difficult to draw, especially in a business environment rich in puffery (inflated bids[1]), corner cutting, contract violations and dispute. Clear cases of fraud are also difficult to identify because unscrupulous contractors can often give at least a colorably (authors note, definition of colorably is seemingly genuine or legally valid) plausible explanation for dubious costs and poor performance. Often these*

[1] Author addition for clarity

explanations take the form of counterclaims against the city for alleged design errors, delays and/or explicit or tacit City approvals. Therefore, it is useful to think in terms of fraud, waste and abuse rather than of fraud alone."

This statement should be cause for great concern for everyone in the construction sector, as it clearly states that construction claims can be used to explain away or conceal additional costs arising from fraud. If contractors are not the perpetrators of a fraud, they have the opportunity to pass on the loss when they are themselves the victim of a fraud. As contractors, lawyers and claims consultants, the books are open to us and we should be aware that the losses we are looking at on a project may not be legitimate delay and disruption costs but may partly include the cost of theft, fraud and conspiracy.

Looking at the costs in this way leads us to the "grey zone of costs in construction" as proposed by Crowe LLP [6 p.27]:

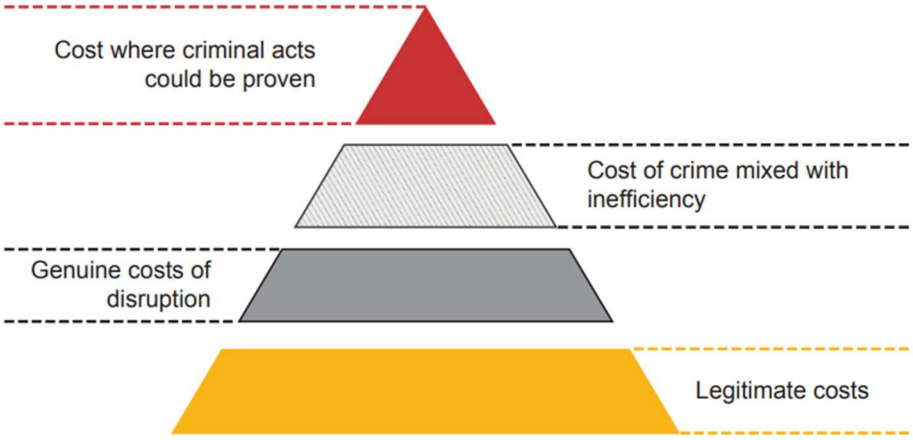

Figure 2 - The grey zone in construction

In this model the legitimate costs (in yellow) are the original contract value plus the value of properly instructed variations. The red zone represents the costs which can clearly be proven to be the result of criminal activity such as theft from the site. The grey zone is the confusing area where there are legitimate costs like EOT's, disruption, wastage etc, but this is also where the costs of fraud and corruption will be included. As construction experts, we are often in a better position than the police to determine, as far as possible, how much of the extra cost arises from legitimate project cost increases and how much cost arises from fraud disguised as delay and disruption cost. From an ethical standpoint we also need to ensure that we are not, inadvertently, complicit in concealing fraud or conspiracy.

2.2 Who are the victims of construction crime?

The victims of construction crime depend on who ends up paying for the grey area described in the last section and that is largely governed by the contract. If the contract was a cost-plus fee contract with no cap or target price, then all of the costs of crime would be treated as legitimate construction costs and would be passed on to the client. If the client is a government agency, then ultimately the victim is the taxpayer. Some of the higher-level crimes described in this report relate to government officials as the protagonists. In these cases, the state and taxpayers end up as the victims as the cost of their infrastructure has increased.

If the project was cost plus fee with a cap, or target price, and some kind of cost sharing agreement then the cost of the crime would be shared in accordance with the cost sharing agreement. The victim would be the client (or tax-payer) and the contractor's shareholders, whose loss would be expressed as a reduction in profit.

A cost-plus fee contract is relatively rare. A more common contractual situation is where a main contractor is engaged in a lump sum contract and self-performs some of the work whilst subcontracting the rest, again with lump sum subcontracts. The following diagram shows a situation where a main contractor is self-performing the structure but subcontracting the MEP and finishes:

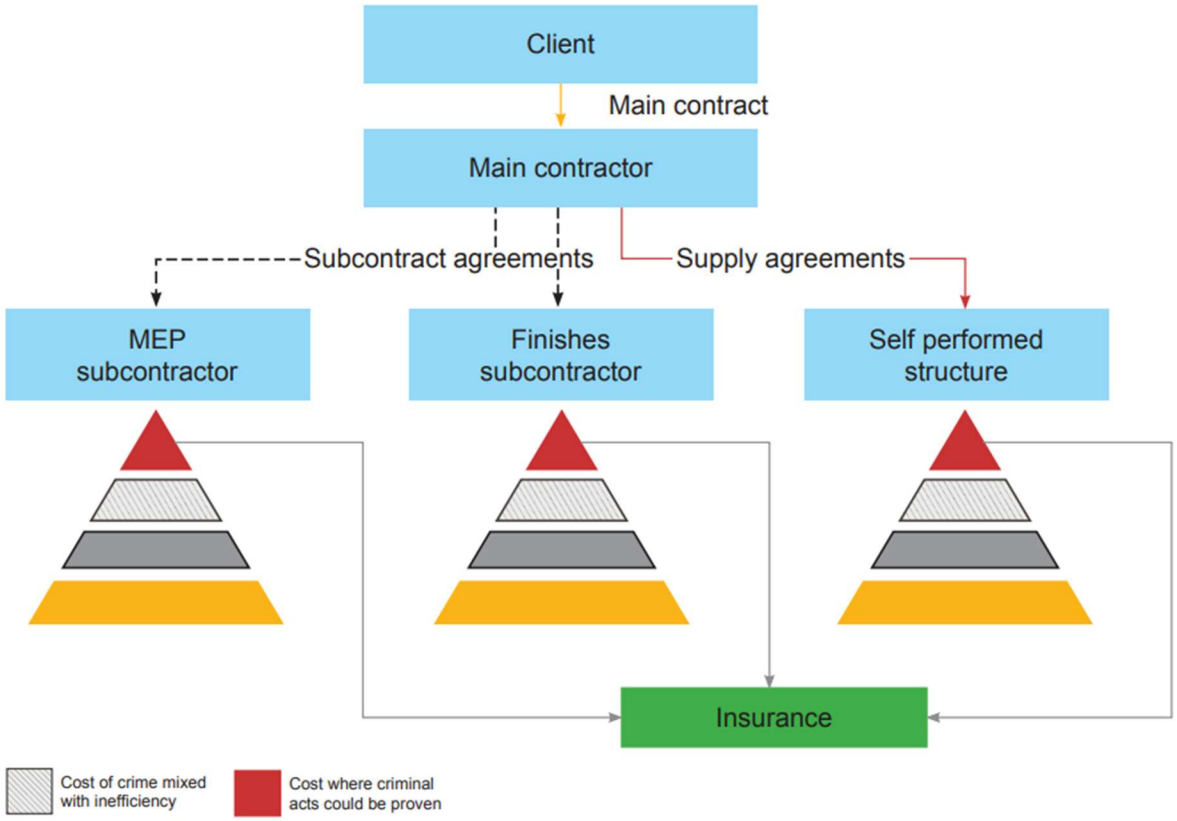

Figure 3 -

In the example there are six sets of costs which result from crime. The three sets of costs which can be proven to result from crime, those represented by red triangles in the diagram, will usually be covered by insurance. For the remaining three sets of costs (those represented by the hatched trapezoid) the subcontractors have initially borne the cost of two of them and the main contractor has borne the cost of the crime in the direct works.

If the subcontractors have had delay and disruption events occur on their works, then they will assume that the costs of the undiscovered crime are part of the delay and disruption costs and seek to recover them through claims allowed for in their subcontract agreements. If they have not had delay and disruption events, then no claims will be possible, and the subcontractors will assume that they have overspent or that the original estimate was incorrect. In this case the subcontractor will be the victim of the crime.

The main contractor will initially bear the cost of the crimes on the self-performed works. Like the subcontractor he will either write off the costs as overspend and a poor initial estimate or he will seek to pass on the costs to the client through claims. In addition, the main contractor may well receive claims for delay and disruption from subcontractors. Some of the cost of these claims will come from legitimate delay and disruption events but mixed in with those costs will be the cost of the crime the subcontractor has encountered in executing his works.

A situation will therefore arise where the three sets of costs related to crime are in the claims process of the subcontracts and main contract. The claims will either be accepted amicably, rejected, disputed and possibly become the subject of arbitration or the judicial process. At the end of this process, the organisations found liable for the costs are the victims of the crime.

2.3 How big of an issue is crime in construction?

The problem with any serious analysis of fraud in construction is the lack of data to work with. By its very nature fraud is covert and there is therefore no way of determining how many fraud events have been successful and simply chalked up to project overspend or disruption cost. Even if fraud is detected, it is often dealt with and punished internally and therefore left unreported typically for reasons of avoiding poor publicity. There are various estimates applied to the cost of construction fraud, none of which can be considered definitive. The low end of the estimates is around 1.9% [7, p.27] of project turnover, with the high end being around 10% [8, p.27] of project turnover. These figures are broadly corroborated by an article in the United Kingdom Financial Times [9, p.27].

Even if we consider the low end of the estimates as being the best case, the 1.9% is still an enormous amount of money, particularly when you consider that any saving in fraud would be an addition to profit. In the United Kingdom and on construction projects, profit margins are typically around 3.9%. In the United States they are 4.6% and in Continental Europe they are 6.1% [10, p.27]. A saving of 2% in stopping fraud would therefore be equivalent to increasing profit by a further 50%. This clearly makes this an issue which merits serious attention.

The writer can offer some personal experience in this area. Of the six cases in which the writer has had involvement in the investigation, the cost of the crime varied between 5% and 15% of project value. However, it should be noted that there were many cases on which no crime was discovered. The writer's opinion is that, if crime is happening on a project, it is likely to be between 5% and 15% but it is impossible to tell how widespread fraud is in the industry as a whole.

3. Reasons for Crime – the triangle and the diamond

Before moving onto specific types of construction fraud, we must consider the circumstances under which fraud occurs. Theft, fraud, conspiracy and corruption are all illegal, so committing these crimes could result in fines, incarceration and loss of reputation, if the crimes are reported to the police. What therefore is the motivation to commit these crimes, when the repercussions of being caught are so great?

In order to explain the motivation for fraud, criminologists first describe the circumstances as a triangle and then later as a diamond. The concept of fraud triangle was developed by the criminologist Dr Donald Cressey in 1950. In this model Dr Cressey considered the influence of three factors: pressure (or incentive), opportunity and rationalization.

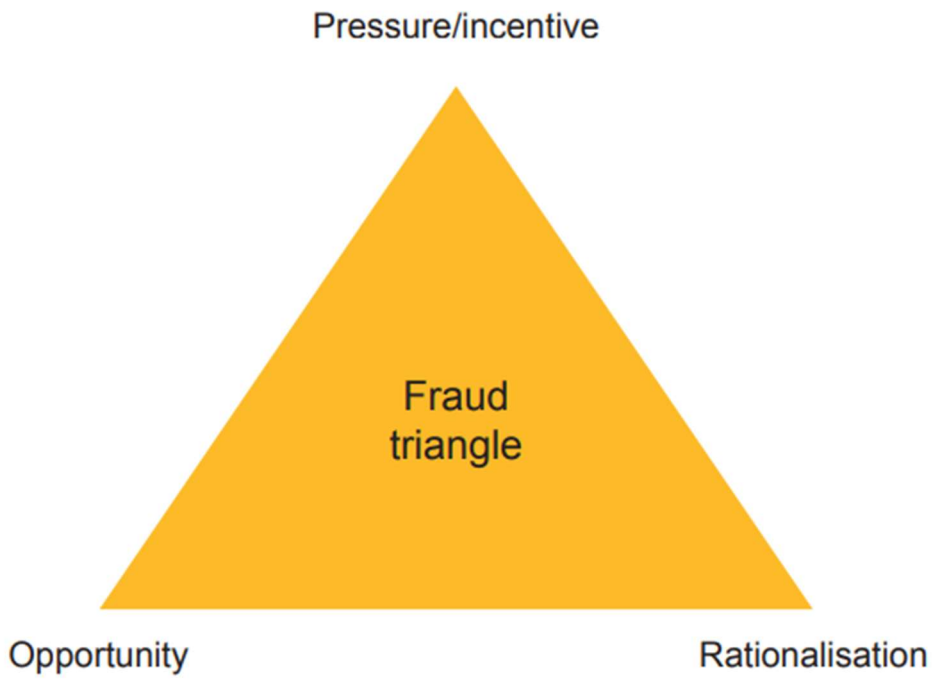

Figure 4– The fraud triangle

3.1 Opportunity

Opportunity refers to the conditions which make a fraud possible. In the construction environment, this can be lack of security, poor management, inadequate procedures on site and ineffective accounting policies.

3.2 Incentive or pressure

The incentive in construction is almost always financial and reference is often made to “life-changing” sums of money forming the incentive. For most people, a sum of money is the motivation, but the scale of the sum required to motivate the crime may vary for different people. This point will be discussed in detail in section 4.2.

3.3 Rationalisation

Rationalisation is the process by which someone justifies to themselves what they are doing and is sometimes referred to as mental gymnastics. The person committing the crime may feel they are themselves a victim through being underpaid, or perhaps have missed a promotion or feel they are overlooked. The mental gymnastics then leads them to feel they deserve better rewards or have perhaps convinced themselves that what they are perpetrating isn't really a crime. Someone who wouldn't particularly dream of stealing from a colleague's wallet might, if all the other factors are in place, readily take materials from a construction site to build an extension to his house.

In 2004 two criminologists[2] expanded the fraud triangle to become the fraud diamond:

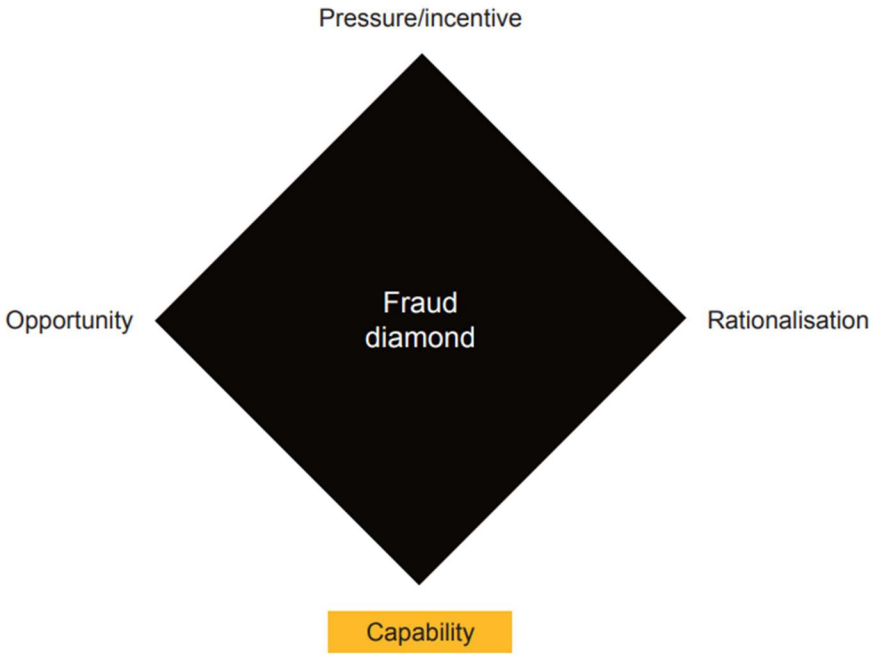

Figure 5– The Fraud diamond

3.4 Capability

In this diamond model "Capability" is added as a fourth factor. This is a sensible addition, as to perpetrate a complex fraud requires a certain skill set in the perpetrators. The person planning the fraud must have the intelligence, technical ability and character capable of carrying out the fraud. In addition, if the fraud expands to become a conspiracy involving other people, the person has to have the ability to persuade and lead others to get involved.

[2] **David T. Wolfe** and **Dana R. Hermanson**

4. The Fraud Diamond as applied to Construction

4.1 Introduction

The construction industry is unique in how dynamic it is. A contractor wins a project and pulls together a team in a very short time frame to manage what can be quite complex work. That team may turn over hundreds of millions of euros in revenue, leading to the recruitment of a myriad of suppliers, subcontractors and consultants, most of whom have won their work package on the basis of lowest bid. The project they build in many cases is at the leading edge of technology and maybe the first of its kind. On completion the construction team dis-bands, as the construction is typically one-off, only to remobilize as a different team, to execute another project at another location. During this whole period the team managing the activities are under immense pressure from clients, and in some cases the media, to deliver the project in time. It is in this context that the fraud diamond should be considered.

4.2 Opportunity in the Construction Environment

The first corner of our diamond is opportunity, and with this the writer would spotlight Winston Churchill's quote:

"*The pictorial battlefield becomes a sea of mud, mercifully veiled by the fog of war*"

This means that the horror of war in often concealed by the vast amount of activity going on as the war proceeds. Everyone's attention is focused on the likelihood of winning and not necessarily on the steps taken to win. Whilst construction is not war, and is not a battlefield, the parallels are striking. What can be drawn is that there are a vast number of activities executed on-site, and whilst everyone's focus is on completion of the work, the controls on projects can slip. In this situation the opportunities for fraud become numerous.

Theft, in any of its forms, can occur in any transaction, whether it be the purchase of materials or the payment of labour. Any construction project has tens, hundreds, or thousands of transactions over the duration of the project. Construction transactions are rarely recurrent which, can lead them to being harder to audit. If a main contractor invites tenders for a product, say windows on a building, the received price may seem high, but the high price can be excused by the particular specification of the product, the difficulty in installation or the availability in the market. If a material is being bought for a factory in the manufacturing industry, the price can easily be compared to the last purchase of that material. A sudden increase in price would therefore be very easy to spot.

Similarly, many activities have a short duration so proper systems of control may not be established for them. Let's say a project is falling behind programme in trench excavation and additional labour is deployed to boost production. The new gang executes work over a few weeks and then leaves. At the end of the month the labour agency issues an invoice for the additional gang. Does the main contractor have a record of how many labourers were on site? Was the gang given security passes, allowing you to check if they came in every morning? If not, it would be easy to inflate the numbers of people supplied and therefore the amount due. The cost of a fraud like this increases exponentially if it becomes a conspiracy, where the time-keeper and security teams become complicit in falsifying the figures.

Another aspect of the construction industry which creates opportunity for fraud is related to the geography of the projects. "Long" or "linear" projects like railways or roads can be hundreds of kilometers in length and therefore have multiple work locations. This could extend to quarries, borrow pits, concrete plants, asphalt plants, plant workshops and off-site fabrication yards. This creates disparate work fronts, spread out over a wide area, making the implementation and management of security measures extremely challenging. Sites become too big to effectively police securely.

4.3 Incentive or pressure on construction teams

Opportunistic Inducements

If the 'downside' is loss of reputation, loss of job, fine or prison, the rewards need to be considerable to induce anyone to committing a fraudulent or criminal act. There is no definitive guide as to what that minimum 'reward' would be, and it likely varies from person to person based on their own moral compass, but it is reasonable to assume that for an average person it would outstrip their annual income. Reflecting on this, a typical site organization chart is identified below.

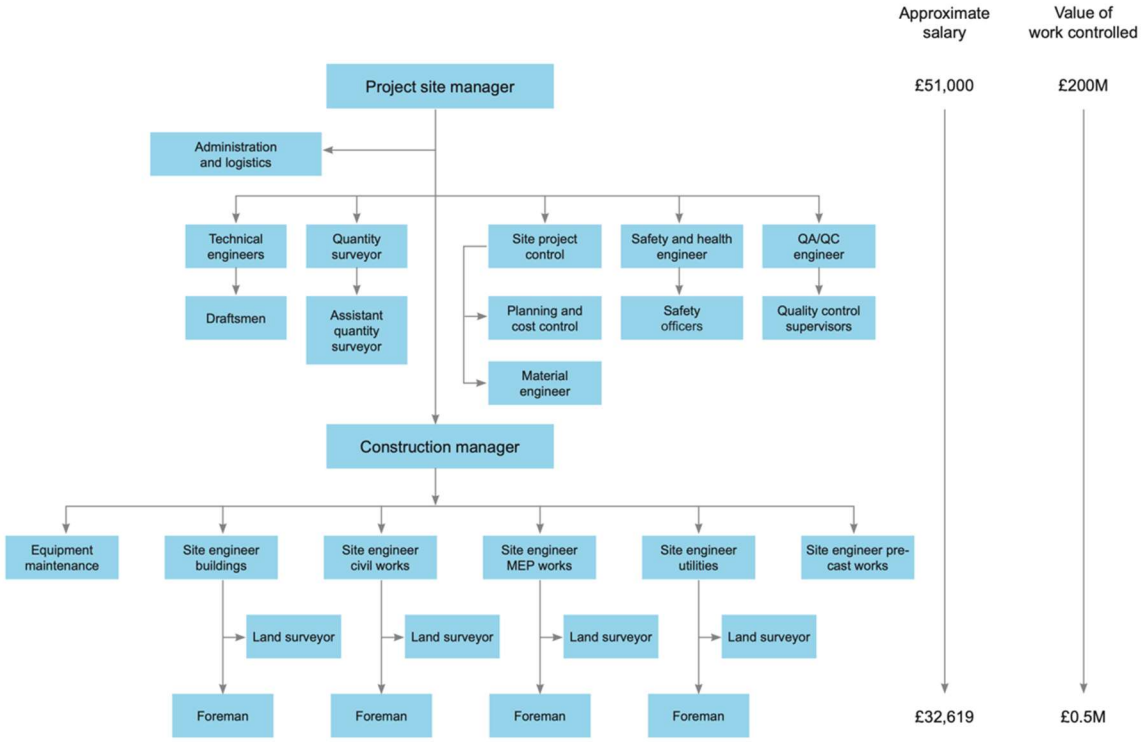

Figure 6– typical site team organization chart

In the construction industry we generally have teams of people paid proportionate to their seniority or rank within the project team. But people in construction are generally paid relatively low amounts of money in relation to the value of the work they may be managing. This appears true for example when comparing construction managers to hedge fund managers, where hedge funds can be similar in scale to construction budgets, but hedge fund managers earn many times more than construction managers.

The table below shows the average incomes for construction personnel in the United Kingdom [11, p.29] and for five particular roles identified in the organisation chart above. In our analysis we define a significant sum of money for each role and also a sum of money that would pose a life-changing sum, where the person to engage in fraud. For the purposes of this analysis, it is proposed that:

- a significant sum of money for each person would be an equivalent to their annual salary, and that
- a life-changing sum of money would be five times the annual salary.

If someone is diligently budgeting to save 20% of their take-home salary [12, p.31] then it would take them around six years to save the equivalent of their annual salary. If they saved this sum for around thirty-one years, it would equate to saving five times their annual salary – in effect paying of the typical mortgage and buying a house.

The notional project forming the basis of our assessment is assumed to be a medium sized project, with a value in the range of two hundred million pounds. The table then looks at the approximate value of work that could be under the management or influence of each person in our table. As fraud can be between 2% and 10% of construction turnover, we have taken the figures of 2% and 10% and applied them to the value of work under a person's control. This is to see if the potential amount of money a person could make from engaging in fraud would fall into the categories of significant or life-changing.

Position	Salary	Value of work under control	2% of Value	Years to save 2%	10% of Value	Significant sum	Life-Changing Sum	Likelihood of fraud
Project Manager	£50,589	£200,000,000	£4,000,000	494	£20,000,000	£50,589	£252,945	High
Commercial Manager	£54,621	£200,000,000	£4,000,000	458	£20,000,000	£54,621	£273,105	High
Quality controller	£30,606	£60,000,000	£1,200,000	245	£6,000,000	£30,606	£153,030	High
Site Engineer	£40,642	£40,000,000	£800,000	123	£4,000,000	£40,642	£203,210	High
UK Labourer	£32,619	£500,000	£10,000	2	£50,000	£32,619	£163,095	Moderate
Ghanaian Labourer	£324	£500,000	£10,000	193	£50,000	£324	£1,620	High

Figure 4 – Likelihood of committing fraud

For each of the roles examined, the table shows that even at the lower end of the estimate of fraud that could exist, the amounts of money available to a person through fraud is potentially life changing and therefore a major inducement for a person to commit fraud.

Our example considers a national United Kingdom project, but the assessment could equally apply in other countries. For example, a comparison for a Ghanaian labourer [13, p.27] can be assessed within the same calculation. In that case, even low levels of fraud or theft would be life changing and therefore be a major inducement to crime.

Inducement by Mobile Workforce

Another aspect of construction that can create an incentive or pressure to commit fraud is the fact that the workforce is quite mobile, or itinerant, and not necessarily tied to any long-term period of employment with a particular employer. Most people working on a construction project are bound by an employment contract that may be specific and time-bound to that particular project. When the project is complete, a person will need to move on and seek employment elsewhere. Should the construction market in general take a downturn, a person may also be looking at a period of unemployment, which in itself may generate significant financial pressure.

For most of the workers on a construction project any period of uncertainty over their financial future generally occurs towards the completion of a project, which is also the time when projects are at their busiest. At this point the "fog of war" can be at its thickest and the control measures are at their weakest. The project is therefore at its highest risk of fraud towards later the stages, as both the opportunity for fraud increases and the incentive for fraud also rises to its peak.

4.4 Rationalisation in the construction environment

A person engaging in fraud must undergo some significant internal debate, to justify to themselves why they are going to engage in fraudulent acts and place themselves at personal risk. In light of this debate and perhaps for the second time in this report, we come on to some grey zones. When we think of the acts of fraud or conspiracy, we tend to think of it as a binary proposition. Either someone has committed fraud before, or they haven't. In practice however, this is not the case. To explore this further we shall now consider a scenario revolving around the simple service of hospitality.

In any business-to-business relationship there is a degree of hospitality between the individuals and parties involved. Someone marketing their company may provide clients with gifts or marketing merchandise. For example, this could be something as simple as company ties, t-shirts, pens, work pads etc. Taking this further, a company representative might, occasionally, stay over at the client's location or be invited to dinner. In some cultures, it is also common to give presents to clients, particularly at Easter or Christmas. In Asia and during the Chinese New Year celebrations it is customary to give "Ampao", which is a red envelope containing money and which signifies a wish for the receiver to be prosperous in the New Year. The more respected you are, the more money is given in the "Ampao". In addition, if the opportunity for business increases in value, so does the pressure to increase the value of the "Ampao".
On occasion, the amount of money can reach tens of thousands of pounds. Some companies engage in team building events or hospitality weekends where clients and their families can enjoy luxury accommodation and events. Perhaps the client can't make it to the event so instead they are given a voucher to make the trip with their family later.

The issue here is balance, or proportionality. I think we could all agree that receiving a t-shirt from a potential supplier is not unreasonable, but giving gifts of holidays in the order of fifteen to twenty thousand pounds is certainly starting to become unacceptable. But the question is, where is the line to be drawn? At which point normal business hospitality ends, and bribery commence?

Some companies set their staff with limits of the value of gifts that can be received, but with a little imagination even this can be subject to greyness. Examples follow:

- a client contact may be given only a raffle ticket at the supplier's team-building function, whose prize value may only be a few pounds. The fact that he, and all of the other client contacts in receipt of tickets, win new cars during the raffle is just darn good luck!
- The supplier or subcontractor company could set up an educational scholarship for gifted students going to university which the client's children happen to be eligible for. If the children were legally adults, the client contact would not have received any direct material benefit which he would have to declare. He just finds himself not having to pay the children's university tuition fees for three or four years.
- A client contact could be gifted membership of an independent sports or social club like a golf club, country club or health spa.

From the perspective of the person receiving these gifts described above, these gifts are technically not a bribe. No one has asked for anything in return for the gift. The gift is not given in return for an inducement. The company giving the gifts may well be a good company who could thrive without seeking this kind of influence. The receiver may also tell themselves that this practice is part of corporate culture in the industry or that everyone does this.

Once the receiver has accepted these types of incentive, they are left open to potential blackmail, when the next large bids are to be awarded. In these circumstances it can be understood how a potential client can fall into a position where they become compromised, had no intention of engaging in fraud at the outset.

4.5 Capability of construction teams

4.5.1 Characteristics of senior managers

The skills which make a person a good manager can also be the same skills to make someone a good fraudster. The ability to plan, to organize and communicate are all fundamental to both the successful management of a project and the successful execution of a fraud. The higher that someone has risen in an organization the greater their capability to carry out fraud and, in general, the higher the cost of the fraud will be.

Whereas a driver or a machine operator has access to fuel and spare parts, a project manager or commercial manager has access to the company's bank accounts and they may have the final say on who wins major subcontracts. Often people in more senior roles are very well respected within their organization and therefore their actions are not too closely scrutinized. This is particularly true where senior managers working remotely from company headquarters. In these situations, the individual has direct control of all of the company's resources in the territory or the region. This could include financial resources, plant resources, material resources and even human resources. If a senior manager directs materials to be delivered to a certain address, his team will make that delivery generally on the assumption that such instruction is legitimate. If materials have been fraudulently sold, the individual involved in delivering the materials will unwittingly have aided and abetted the fraud.

4.5.2 Teams within companies

Another aspect of the construction industry which leaves it open to risk of fraud or collusion is the tendency for networks to grow within construction organisations. It is not uncommon in construction that when one individual moves to a new project they fill other roles in the organization chart with people they know and draw in from previous projects. We have probably all come across project managers. Commercial managers and senior engineers who have worked together over multiple projects, and there is nothing inherently wrong with this, as these teams will have developed a rapport and a confidence in each other's abilities over the years. A project, and organization as a whole, benefits greatly from strong professional teams who mature and develop over time and have been tried and tested on multiple projects. However, should such a team develop an appetite for fraud, it can pose many difficulties for a company. For a conspiracy to defraud to happen, there has to be trust between the parties and it takes time for that trust to build up. A project manager and a commercial manager working together for the first time would be unlikely to commit fraud together, but if they are already old friends, went to the same university or worked on multiple projects together, then that level of trust would exist to a point where, given an opportunity arises, the team my jointly agree to commit a crime.

4.5.3 Gender of people committing crime

One point which must be considered when studying the capability or attributes of someone committing fraud is gender. Whilst this is not a psychology paper and does not attempt to address the differences in male and female motivation, the statistics on numbers of women committing crime versus men speaks for itself.

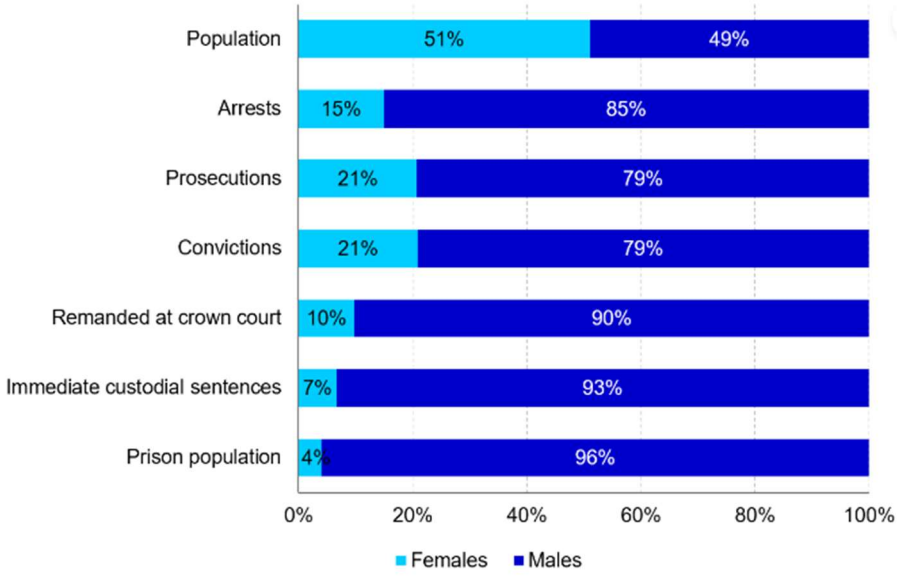

Figure 8 -Prison population in UK by Gender

The table above [14, p.34] shows how much higher the incidence of crime is with men, versus women. On face value, men have a significantly greater tendency, or less aversion, to commit crimes.

It is important to note that this table relates to crime in general, not construction crime, but it also may be observed however that construction is dominated by men. Unfortunately, no such figures are available for crime specifically executed within the construction industry. In researching this paper, the writer studied dozens of cases of construction fraud, and it was interesting to observe that in none of them were any of the protagonists identified as being female. However, as the cases studied were all cases where the crimes were discovered and prosecuted, the logical conclusion one must draw from these figures is that either women are much less likely to commit construction fraud than men, or that women are much better at executing construction fraud than men, and by extension are less likely to be caught.

5 Common Frauds and detection

5.1 Introduction

This section explores the most common types of fraud involving construction and how fraud in construction may be detected. This is analysed and written from the perspective of an external consultant who has come onto a project and suspects that fraud may have occurred or may be ongoing.

For situations where fraud may have occurred in the past, most methods of detection rely on finding data sources alternative to those that have been presented for payment. For example, if payment had been made for say sixty workers on site during a particular period, but one may suspect that those sixty workers were never present, it might be possible to check the invoicing paid against:

1. The security records how many people came into site on those days, or
2. A check with the safety department how many safety inductions may have been given, assuming a safety induction was a requirement of entering the site, or
3. A look at CCTV from the site entrance to count how many workers were present on those days, or
4. Daily site diary sheets to prove, or disprove, how many people were present working on site.

With this information it is possible to discredit the initial data on which the payment was based.

A consultant who believes they may have discovered a fraud that was ongoing needs to approach the situation with caution. There are a number of points which need to be borne in mind in these circumstances as follows:

- The individuals involved in the fraud have a great deal to lose and therefore may react unpredictably, possibly placing the consultant in danger. Some construction frauds may even be perpetrated by organized criminal enterprises; in which case the consultant would certainly be put at personal risk.
- If the perceived fraud is actually a conspiracy, then the consultant would need to be very careful who they report the fraud to. If a fraud is discovered centered on, say, the senior engineer, and the consultant reports it to the project manager, there is no guarantee that the project manager is not also involved. In general, it would be safer to report any possible fraud to the head office and not to the site team.
- The consultant is unlikely to have the skills (surveillance, video and audio recording) to be able to gather physical evidence of a fraud, so consideration should be given to involving the police or approaching a licensed private detective agency.

In the cases of on-going fraud which the Writer has been involved with, under the direction of senior management the Writer hired with his own funds a licensed private detective agency to investigate the fraud, with those costs recovered as a cost for “consultancy services”. Whilst this service procurement appears unorthodox, this approach was taken with the full authority and permission of senior management. This was done to ensure the accountants and managers in the company would not be made aware of the investigations underway, thereby avoiding the possibility of any accidental leak of information alerting the individuals directly engaged in the suspected fraud.

5.2 Diversion of project funding

Description
Sadly, there are many instances of project funding being misappropriated by individuals, and commonly a misappropriation by government figures. In these cases, projects have been set up as a means of attracting outside investment to a country, but with the objective of diverting some, or all, of those funds to individuals with an outsized influence over the project.

An example of this is the Ajaokuta Steel Company (often referred to as the Abacha Steel Mill Company) which was founded by the Nigerian Government in 1977 to produce steel in Nigeria for domestic use and for sale to other countries in West Africa. The objective of the project was laudable – to build steel capacity in the region and reduce the West African reliance on foreign steel imports, whilst creating jobs in the region and driving technology transfer from Europe and America to Africa. 1977 also marked the height of the cold war between the USSR and Western Countries, leading to a competition for influence in Africa and a willingness by foreign countries to fund projects to secure influence. The project financing for Ajaokuta was restructured several times. Some debt was forgiven and written off, so it is difficult to put an exact figure on how much money went into the plant over the next 40-plus years, but conservative estimates put the injection of cash in the order of ten billion dollars. [14, p.27] This is an enormous amount of money to invest, especially in light of the fact that in the passing forty-seven years the plant is still to produce any steel.

This Ajaokuta project is also a good example of the 'sunk cost fallacy' which works as follows:

- On the project the developer secured financing of, say, two billion dollars. Part of the money is used on some construction so that there is something tangible to show the donor, but the rest of the money is diverted.
- Once the two billion dollars has been expended, the project the developer meets the donor and perhaps tries to explain away some of the losses in the manner the New York Task Force on organized crime referred to. "*Clear cases of fraud are also difficult to identify because unscrupulous contractors can often give at least a colorably (authors note, definition of colorably is seemingly genuine or legally valid) plausible explanation for dubious costs and poor performance. "*
- The upshot of the discussion is that the developer now wants another one billion dollars to complete the project. But the donor now has a dilemma. Part of the funding would typically be a loan. The loan cannot be repaid until the project is complete and steel is being produced. Does the donor write off the initial two billion dollars and stop the project, or add another other one billion dollars to the two billion dollars cost, to attempt to complete the project within reasonable time and allow the loan repayments to start?

In this case of the steel plant, the donor elected to add the additional finance, pushing costs to three billion dollars, but this cycle never ends. When the cycle repeated, the donor became even more committed to add more cost to the project finance, with completion of the project seemingly moving even further away.

Detection / Preventative measures

Preventative measures are primarily the responsibility of the donor agencies. Since the Ajaokuta example, the donor agencies (European Union, World Bank etc) have started directly managing the tender process and project execution, rather than transferring funds to the host country. They have also strengthened their procedures and oversight of the projects under construction. As a result, the egregious examples of misuse of project finance seen in the 70's and 80's have greatly reduced although it would be unwise to assume that they have stopped altogether.

External consultants, like resident engineers or claims consultants, normally come onto a project after the funding is in place and the project is active. There would therefore be no indication of funds which would have been diverted prior to construction starting. Should a consultant be appointed to work for a donor agency then it would be important to ensure that any claims being submitted are for valid events causing delay and disruption and that the claims are not simply a cover for increasing the funding. As with all forensic fraud detection the key will be to find alternative data to that which has been presented. This will include all correspondence, site records, site photos, diary sheets, security records of who was on site etc. If these records are not consistent that the events occurred, then doubt may be cast over the claim.

5.3 Bribery in obtaining work

Description
Bribery involves an individual or company offering an officer in charge of adjudicating a bid an incentive to fraudulently award the contract to them. It can also be an official soliciting a bribe in order for a contract to be awarded. This is probably one of the most common forms of corruption or conspiracy.

A bribe does not necessarily have to be in the form of cash. There are many cases where, for example, additional vehicles have been priced into a project listed as site management vehicles but then transferred to adjudicating officials as soon as the contract starts. This practice was so widespread that some of the donor agencies started excluding the purchase of vehicles from any finance package they approved.

Bribery in any form is punishable under both the United Kingdom [16, p.27] and the United States [17, p.27] laws and in both cases a crime committed overseas can be punished in the home country. Both the individual committing the crime of bribery as well as the company the individual worked for can be punished under the act if it can be proven that the company encouraged or had knowledge of the act.

One well-publicised case of bribery is that of Mabey and Johnson. [18, p.42] In that case, business development directors for the company engaged in large scale bribery of officials in Ghana, Jamaica and other locations in order to obtain contracts. The bribery took place from the early 1990s through to 2001. The company board of directors was aware of the practice of bribing officials. Detailed records were kept of the sums paid and to whom sums were paid. To give a sense of the scale of the crime, approximately one million pounds was paid in bribes to secure sixty million pounds in contracts. The bribery went undetected until a new senior manager at Mabey and Johnson found records of the bribery in the company's archives. The manager ordered an internal investigation by the company's solicitor, the findings of which were handed over to the serious fraud office in the United Kingdom who passed the information on to their counterparts in Ghana and Jamaica. Mabey and Johnson were convicted of bribery and had to pay £3.5 million in fines and £3.1 million of legal costs.

The writer has some direct knowledge of this case, as he was working in the region of Ghana where the contracts were executed and whilst they were under construction by the Mabey and Johnson teams. The contract in question was for the design, construction and installation of a number of prefabricated steel truss bridges (similar to the British Military "bailey bridges"). All of the locations chosen for the bridges were extremely remote and difficult to get to. Individuals familiar with the projects were confused as to why bridges were needed in remote locations which, in some cases, did not even have roads. At the time it was assumed that the bridge construction was part of a master plan and that the roads would be constructed later. In fact, the whole project was created as a result of the bribe and the remote locations were chosen to limit scrutiny. Whilst the bridges were useful to the local communities in which they were located, they were certainly not a national priority.

Detection
The type of bribery which an external consultant is likely to come across is bribery of a main contractor to obtain a subcontract or supply agreement. If the bribe was in order to secure a contract which had been priced at market rates it would be difficult, if not impossible, to show that bribery had occurred. In that case the subcontractor or supplier could well have won the contract without the bribe.

If the bribe was to secure the contract at above-market rates, then it may be possible to demonstrate possible bribery by re-examining all of the bids made. It is common when assessing bids for the assessor to add sums to some of the tender if he feels the tenderer has missed something so that he is comparing bids on a like-for-like basis. It is that process of adjusting tenderers submitted prices where a high bid can be made to appear as a low bid. By re-examining the original bids, it may be possible to show that the adjustments were not legitimate. A comparison should be made between the quoted amounts and the final adjusted figure which went into the tender comparison. Bids which went from a low quoted figure to a high final figure should be carefully examined.

5.4 Collusion in Obtaining Work

Description
Collusion is a form of conspiracy where the colluding parties agree to work together secretly and illegally to deceive others. In the case of a bid or tender process the bidding parties come together in some form and secretly agree between themselves which company will win the tender, by agreeing prices together and agreeing beforehand who will submit the lowest price. The submission of one "real" bid and numerous false bids creates the impression of a competitive tender process. For the conspirators there are clear advantages to doing this:

a) As they will collude on all of their tenders, allowing them to control their workload at favourable prices.
b) In a competitive tender situation, there is pressure to quote prices at the lowest level the contractor can bear. By colluding this pressure is removed and the contractors can price work at more profitable levels.

Collusion is very common in the construction industry. In the United Kingdom some one hundred and three construction firms were fined £129.2 million between 2000 and 2006 for colluding on one hundred and ninety-nine tenders. [19, p.46]

One form of collusion is a practice known in the United Kingdom construction industry as "cover pricing". Cover pricing is where a contractor does not want to do a project (perhaps their resources are fully committed to other projects) but they do not want to seem unco-operative by not submitting a proposal. In some cases, not submitting a price may lead to the contractor not being allowed to bid on future projects. In such circumstances a contractor may communicate with another bidder or bidders to ask for their pricing in order to put in a figure higher than them and thus ensure they do not win the project. This practice is illegal in the United Kingdom and can lead to fines of up to 10% of the company's annual turnover.

Detection
Bidding a complex construction project requires quite a lot of work. Usually, an estimator and a planner work together for weeks or months negotiating with subcontractors and suppliers, preparing bid documents, writing method statements and preparing the tender programme. In the situation where collusion is taking place the contractors putting in the false bids will not want to go through all of that effort. What typically happens is that "real" bidder will do all of this work and pass the genuine bid documents to the other contractors. They will then modify the documents and add their own company logos in the hope of convincing the bid adjudicators that the bids are genuine, if a bit high.

The only opportunity to detect collusion is by reviewing the different bid documents for similarities. Obviously, the prices will be different, but humans tend to be lazy and work in round figures. You may find that the rates in the BoQ's of one false bid are all exactly, say, 10% higher than the real bid. You may find that the method statements and environmental statements include for exactly the same measures but just reworded. One document which is particularly difficult to modify convincingly is the tender programme. Whilst superficial changes like the names of activities are easy to make, adding or deleting activities, changing links or modifying the format of the programme (called the Work Breakdown Structure or WBS) is more difficult and requires the services of an experienced planner. A careful examination of the electronic files of the programme can often show that the tender programmes are basically all identical.
This is an area where technology may be able to assist in detection. AI tools to detect plagiarism are already widely used by universities and could easily be used to analyse bid submissions.

5.5 False Flag Bids

Description
The phrase “false flag” is a reference to shipping where ships would fly the flag of another country in the hopes of avoiding an attack. In modern popular culture “false flag” operations appear in spy dramas, where the security services from one country run an operation pretending to be from another country, to provide sufficient deniability and therefore assisting the bad actor in avoiding criticism.

In construction false flag bids are where an official of a company enters a bid for work on behalf of the company but does not make the company head office aware of the work being awarded. The official then uses company resources, which are usually close to the project site, to carry out the work but diverts the funds to an account controlled by him.

False flag bids are quite rare, but they have been included in this section because the highest value fraud which the Writer has been involved with was one a case of a false flag. In the Writer’s case the fraud was not prosecuted, and the details have not been published, so this example will be discussed in general terms only. Section 4.5 of this report examined the capability of construction staff to engage in crime and demonstrated that senior, trusted staff can perpetrate particularly high value frauds.

In this case the individual was a trusted senior project manager who had been with the company for more than a decade. The project in question was in an area remote from the head office. The project manager was, legitimately, a signatory on the local bank account. He then opened an account in the bank with a very similar sounding name to that of the company he worked for. If the company was called Smith Construction, this new account was called Smith Construction Services.

Whilst the project was ongoing a number of smaller projects came up for tender in the area near the site. These projects were similar in nature to the main project and used many of the same materials. The project manager bid for these projects under the legitimate company’s letterhead, only changing the payment terms such that all payments were to be made to the new account. The bids placed were very low so the projects were easily secured. All of the costs of these projects were put through the legitimate company’s bank accounts whilst all of the payments went into the new account, controlled by the project manager. As far as can be determined, only the project manager and commercial manager were aware of the crime, (which means this would fall into the definition of a conspiracy) with everyone else thinking they were working on legitimate variations to the original project.

The fraud was discovered when a driver being investigated for fuel theft was tracked to one of the illegitimate projects. The investigator tracking the driver submitted a report to the head office referring to the driver stopping at a particular job site. The writer was familiar with both the original project and all instructed variations so he knew that no work should have been happening at that location. By the time the crime was discovered the losses were close to one million euros. In that case an agreement was made for there to be no charges in exchange for the return of most of the money.

Detection
In our example the fraud was discovered purely by chance. Modern fleet tracking GPS’s and software are very good at detecting these crimes as they are happening. They can also be detected by looking at the original scope of work plus all variations and identifying a list of all legitimate work fronts. These would include any quarries, borrow pits, plant workshops etc. A review of labour and security allocation sheets would then show if any workers were deployed to areas away from the legitimate workfronts.

An indicator that such a fraud is happening could be a sudden increase in monthly project running costs. As the new illegitimate workfront starts the monthly cashflow would increase as additional labour plant and materials were allocated. A review of the cashflow, side by side with the project programme would show that the expenditure had

increased but that no new works were starting, as the project programme would only show the legitimate work activities.

5.6 False invoices, Overcharging

Description
False invoicing and overcharging are similar frauds in that they both relate to procurement and invoicing and both rely upon lack of proper control measures to be successful. False invoicing is where someone in the procurement or administration team accepts invoices for goods and services which were not provided to the project. The company submitting the invoices may be a legitimate company or could be a shell company set up for the purposes of the fraud.

Overcharging is where an administrator or procurement official is paid to knowingly procure goods or services at a level higher than the market rate. This is particularly dangerous because if financial controls are removed from the procurement process it is entirely possible that quality controls can also be removed. This could well lead to sub-standard products being included in the construction. An example of both false invoicing and overcharging was in the case of the Builder's Group in New York [20, p.27]. In that case, three officers of Builder's Group were found to have engaged in widespread false invoicing and overcharging. The officers were found to have stolen nearly seven million dollars. The case resulted in nearly three dozen convictions and thirty-two million dollars in fines.

Detection
Both false invoicing and overcharging relay upon lack of oversight and weak procedures to be successful. False invoices are relatively easy to detect once attention is given to the correct transactions. The following measures can be taken:

- Check on the ownership of all suppliers and subcontractors to see if any were set up by officers of the company or their friends and families.
- Check if subcontracts or purchase orders are in place.
- Check who approved the subcontracts or placed the purchase orders.
- Review the bid process, check if any other suppliers invited to give prices.
- Check site records to see if any materials were actually delivered or any services provided.
- Check if any of the materials invoiced are actually needed on the project.
- Use of weighbridges to measure materials delivered to site.

In cases of overcharging the fraudulent officer will usually have come to an arrangement with a single supplier or subcontractor. To detect cases of overcharging the following steps can be taken:

- Review all subcontracts or purchase orders where only a single source was approached.
- Check site store records and security records to see if the goods were actually delivered to site.
- Check the quantity of materials delivered to see if they match they amount needed on the project.

5.7 Over measurement

Description
In projects which include a remeasurement element it is possible that the engineer measuring the works is paid to fraudulently inflate the quantities of materials recorded for that section of the works. Remeasurement is often used for some types of foundation works like piling, unforeseen rock removal and earthworks. In this fraud the client's engineer and the contractor's engineer both create documents recording the actual quantities as greater than actually encountered. The contractor later submits the invoice using the higher quantities and, as far as anyone can tell, the quantities are correct because they match the records from the client's engineer.

Detection
Detection of this type of fraud can be achieved by carrying out spot checks on the activity in question to see if the actual quantities tally with that recorded on site.

Detecting this type of fraud after the fact, relies upon finding a data set which contradicts the data submitted to support the invoice. If the work is being done in a secure area the security records (or CCTV) may record the number of trucks coming in and out. If, say, twenty concrete trucks with a capacity of five cubic meters each have been recorded coming onto the site then they can't possibly have delivered more than one hundred cubic meters of concrete. Similar information may be available from site engineers site diaries. Similarly, the concrete may be supplied from a ready mix supplier who may be willing to confirm the quantities delivered to a particular site, particularly if he fears that having been unknowingly involved in a fraud. In addition, trucks leaving a site will have a limited capacity and approved tip sites normally keep a record of the volumes of materials dumped there.

For earthworks companies have also started using survey drones to check the measurement of earthworks. This is a very cheap and efficient way to create an alternative data set to check the data on which payment applications are based.

5.8 "Ghost" workers

Description
Manipulation of the payroll system is a very common form of construction fraud. In this fraud documents are created for non-existent workers. Salaries for these ghost workers are paid into legitimate bank accounts and then transferred out to the accounts of those engaged in the fraud. These types of fraud usually involve the time-keepers on site or the site Human Resources department. Such frauds can be quite extensive in 2022 the South African Railway Authority (PRASA) carried out checks on its workforce using external consultants, who found that of the 17,268 registered workers 2,143 (11%) were ghost workers [21, p.54]. It is not known how long this fraud went on for, so it is impossible to determine the scale of the fraud.

Detection
Once again detection lies in the availability of an alternative data set than that which was presented for payment. Data can come from the following sources:

- Security records such as badge entry.
- CCTV footage where a count can be made of the number of workers entering the site.
- Safety inductions. If it is a requirement to have a safety induction then the number of safety inductions should match the number of workers on site and the workers first day on site should match the day of their induction.
- Bank accounts. Check if any workers have the same bank account or if a large number of workers have their accounts at the same bank or branch.

5.9 Stealing

Description
The simplest crime in construction is stealing. The products most susceptible to being stolen are those which can be turned into cash quickly eg mobile phones, laptops, fuel, tools and metal which can be sold for scrap. Large pieces of mechanical equipment whilst valuable, are difficult to steal and difficult to sell. Having said that some large pieces of plant are occasionally stolen to order. The writer was involved in one case where a caterpillar seven hundred and seventy-seven dump truck which had been confirmed as being on a ship in Lagos but was missing by the time the ship docked in Accra. This dump truck was two storeys high and weighed around seventy Tonnes unloaded so it was

definitely stolen with a client already identified. Whilst the theft was covered by marine insurance significant time and production was lost to the client awaiting the new vehicle to be shipped.

The items mentioned above as being most likely to be stolen may appear to be small items but if theft reaches endemic proportions, it can cause real problems on sites. This is particularly the case with fuel. Large road and rail projects consume large quantities of fuel so if fuel theft is not kept under control theft can easily reach tens of thousands of dollars per week.

Quarry materials are also very susceptible to theft. Quarries tend to be in remote locations where oversight is difficult and their products, aggregates and quarry dust, are in high demand for the smaller-scale construction market.

Detection

For most of the products and materials mentioned the theft is evident because the product has gone missing so for these materials investing in prevention of theft is important. This can include CCTV and robust site security. For the particular case of quarry products, in addition to the prevention measures already mentioned, the manufacturers of the quarry equipment should be able to advise how much fuel you would expect to be using for the type of production you have. If you are using significantly more fuel per tonne of product than the manufacturer advises, then you may have a problem with product theft.

6. Conclusion

In this paper we have reviewed the reasons why the construction industry is so vulnerable to crime using the concept of the fraud diamond:

- Opportunity- the nature of construction is that a high level of activity, many thousands of transactions and multiple work fronts can lead to a lack of control.
- Pressure or Incentive – construction professionals are paid relatively little in relation to the value of the work they control and there may therefore be a temptation to engage in crime.
- Rationalisation – the construction environment can create situations where an individual is slowly drawn into crime over a period and where they may rationalize that each step towards that point is justifiable.
- Capability - the skills required to be an effective construction manager, planning communication and organizational capability, are exactly those required to organize a crime.

We also examined the most common crimes which result from this vulnerability:

- Diversion of project funding- the diversion of funds intended for construction projects.
- Bribery in obtaining work.
- Collusion in obtaining work.
- False Flag Bids.
- False invoices and overcharging.
- Over measurement.
- “Ghost” workers.
- Theft.

The purpose in examining these crimes is to provide some guidance on how they may be detected, ether contemporaneously or forensically after the fact. The common theme in the detection of these crimes is to have access to alternative data to the data which has been presented to substantiate costs. For example, if someone is claiming that a certain number of workers were on site by presenting their timesheets, then the alternative data may be from the site security system, perhaps an electronic entry system or CCTV footage from which a head count can be conducted. If a company is trying to set up systems to prevent crime on site these systems should focus on creating the alternative data which can disprove, the data which may be presented to support fraudulent costs or corroborate data used to support genuine costs. Use of GPS trackers on vehicles, CCTV, electronic entry systems, two-level systems of checking measurement can all be beneficial depending on the circumstances. One should also not underestimate the value of the humble site diary. A well-kept record from each site supervisor and engineer of who was on site and what they were doing can be invaluable in countering fraudulent claims.

Let us again consider the grey zone where the cost of crime ends up:

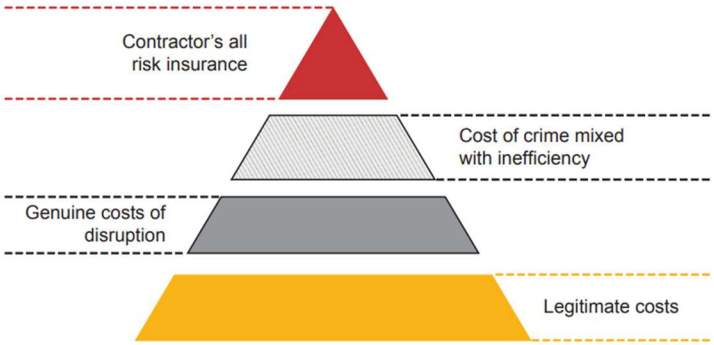

Figure 6 – The Grey-Zone of construction costs

When assessing cost of disruption, a contractor or consultant will usually use a “bottom-up” method of calculation like system dynamics, a measured mile or using disruption factors from academic studies. These methods will produce a cost of disruption to which the contractor is entitled. In most cases the entitlement will be less than the contractor’s costs. The delta between the entitlement and the costs will include inefficiencies for which the contractor is responsible, estimating errors and the cost of undetected crime. If it is possible to show that a crime occurred, then the cost of that crime can usually be recovered through the contractor’s all-risk insurance. As we have shown in this report the cost if crime can be significant so it is certainly worth keeping in mind that crime may have happened and investigating if it can be proven.

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