



Problems and Problem Attention in the Construction Sector – Understanding the Influence of Human Factors

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Abstract

Problems concerning quality and productivity in the construction sector have been a recurrent issue for many years and seem to remain in spite of various initiatives for resolving them. This situation is a result of human action. From social sciences we know that psychological factors crucially influence action design. Knowledge of this influence seems however to be underestimated in the construction sector, and could represent a missing link between strategies, plans and instructions, and the actions carried out. In order to prospect for new problem solving approaches we undertook a questionnaire-based survey to investigate how individuals in the sector perceive the importance and occurrence of, and attention directed to, different proposed causes of inadequate performance. The design of the questionnaire enabled comparisons of different answers to look beyond the respondents' overt answers. The result suggests that (1) the whole problem solving situation, including individual, relational and contextual problem components should be addressed as 'the problem'; (2) the workforce has the ambition and courage to do what is expected but does not always have adequate information and the ability or resources to do it; (3) the approach taken in this study appears to have the potential for looking behind the façade, by detecting different kinds of contradictions.

Keywords: Construction sector, Survey, Problem formulation, Problem attention, Human psychology.

Introduction

The construction sector has for long been criticised for deficiencies and defects, cost overruns, delays, unethical business methods and the like. Despite initiatives, academic as well as industrial, to rectify the problems, a Swedish government report (Statskontoret 2009) established that: "[the] number of construction defects [...] has probably not diminished. [...] Independent judges with close experience from the sector claim that the range of defects has instead increased (p. 14)."

In their search for explanations as to why the problems remain, some researchers have come to wonder whether or not there is something missing in today's theoretical understanding. On an overall level, Garel (2013) notes that 'while there is a global conception of [project management], there is no unified theory', but rather 'an articulated collection of best practice.' Lalonde et al. (2012) go as far as talking about a knowledge crisis within the field of project management, which 'calls for not only a re-examination of the complex relationships between project management theory and practice, but also a rethinking of project management research itself in order to better grasp these relationships.' Some critics argue that traditional research usually assumes an idealised image of the organisation as an orderly, limited phenomenon (Green & May 2005). An alternative, more fruitful approach would be to see the organisation as 'a fluid and dynamic web of complex social, economic and political relations' where 'fragmentation and conflict, are the "natural" state of affairs' (Bresnen et al. 2005). Bresnen et al. (2001) and Ofori & Toor (2009) point out that construction management research has taken a different path than mainstream organisational management research, by being more influenced by engineering, production and operations management. When construction management research has applied ideas

from social science, Bresnen et al. (2005) have noted that it has not always been firmly based on its theoretical and methodological foundations.

In order to search for new explanations as to why problems in the construction sector seem so difficult to solve, and why transformation seems so hard to implement, we have investigated (1) how practitioners in the construction sector assess different problems and conditions in their daily work, and (2) if there are any patterns in this that can explain different kinds of problems. This was approached by addressing the practical joint problem solving situation from a psychological perspective.

Our aim is to try to understand the construction sector's problems as a result of the actions of individuals. A starting point is that actions are formed by the individual as the result of an interaction between the individual's psychology and the current situation. By examining how individuals in the sector perceive various phenomena in their daily work, we expect to be able to better understand the reasons for inadequate performance.

Action and the Human Factor

Understanding the Human Factor

In an early study, Ericson & Johansson (1994) pointed out that problem formulations in the construction sector give preferential treatment to technical issues, such as logistics, quality, efficiency etc., forgetting or underrating the 'human factor'. Almost 20 years later, Wilkinson et al. (2012) note that although it has long been known that managing staff correctly can be crucial to a company's performance, interest in this subject remains low in the construction context. Davey et al. (2002) came to a similar conclusion when they suggested that further research was required to examine, at a deep psychological level, the processes that occur.

If the area is divided into two dimensions, one representing the type of question asked – (A) *what* happens (and how can it be improved)? and (B) *why* is it happening (and how can it be improved)?, with the other dimension representing the object of the study – (C) effects of human action and (D) human action per se, it can be seen that very few studies are concerned with the combination BD, *why* is it happening and human action per se. The common approach appears to be the combination AC, *what* happens and effects of human action, where the human individual or the working team is viewed as a 'black box'.

Even if not in abundance, there are recent examples of research trying to look into the black box and connect inner human functions to what is happening in construction. One example is Sunindijo & Zou (2013) who investigate the role that emotional intelligence might have on construction safety. Lowe & Skitmore (2011) investigated how the learning climate in some practices correlates to individual learning styles. Chiu and Ng (2013) link work group identification to organisational commitment and outcome. Boyd (2013) makes an alternative interpretation of the purpose of knowledge management, from 'to think better about practice' to 'supporting people to act better in practice.'

Human Action and Information Distortion

Human action is designed in interplay between the actual situation and the acting individual. Correct information is considered to be of central importance in order to master the complexity of construction (Winch 2002). At the same time, we know from different disciplines of social science and from experiences in the domain of practical project management (Kutsch et al. 2011; Brady & Maylor 2010) that humans regularly distort information for different reasons. Russo et al. (2008) go as far to say that '[the] distortion of information during a decision seems to be nearly ubiquitous.' This distortion is normally blind to the individual, which has been accounted for by several authors, e.g. Argyris et al. (1985), Khaneman (2011), Cohen & Sherman (2014). In psychodynamics theory, information distortion is explained to be a result of *psychological defence mechanisms*, serving to help

the individual avoid anxiety. These mechanisms operate automatically and beyond our awareness in situations that are at risk of becoming embarrassing or threatening (McWilliams 2011; Cramer 2000). Social psychologists have noted that people regularly make *attribution errors* when trying to create a full picture from the fragmented information available (Heider 1958; Malle 2008). Argyris et al. (1985) have recognised a gap under certain conditions, between the values that persons express (espoused-theory) and the values implied by their action (theory-in-use). The reason is said to be an inconsistent and contradictory strategy or thinking pattern.

In their review of a critical perspective of project management theory, Bresnen et al. (2005) have noticed similar inconsistency in the 'quite significant gaps that can arise between the rhetoric and reality of management initiatives such as lean construction, business process re-engineering and partnering'. Another example of this gap is the stark finding reported by the investigators in an official inquiry into Swedish construction sector (Bygghälsögruppen 2002):

"[a] lasting impression of the commission's work is that the actors [in the construction sector] generally agree about the problems presented, but consistently do not consider themselves to have anything to do with either the genesis of the problems or their solutions".

This attitude, if it is prevailing in the construction sector, indicates an inconsistency in the actors' perceptions of the problems in the sector that might contribute to an explanation the persistence of the problems.

The following sections discuss three central themes of the study: (1) the situation, (2) the individual and (3) the individual's interpretation of the situation.

The Situation, the Individual and the Interpretation

The Situation – Joint Problem Solving

Problem solving includes on the one side, the trouble or inconvenience to be eliminated, and on the other side difficulties of the problem handling process itself. For example, Oyedele (2013) identifies three categories of demotivating factors influencing architects in their daily work: project related, design team/co-worker related and organisational criteria. Together, these problem components constitute the task to be solved.

In order to identify such additional process-related problems, a joint problem solving situation is visualised in Figure 1 (a). In the figure, the problem solvers, pulled out of their context, are provided with boundary conditions, i.e. output and input, according to systems theory. Several problem components can be identified:

- The trouble/inconvenience that should be removed (P_T).
- The problem solvers themselves (P_I). If the wrong actions are carried out the problem solving process will fail or at least be inefficient.
- The relations between the problem solvers (P_R). Emerging phenomena on the group level can trigger reactions in the individual, e.g. social influence and group mechanisms as power, harassment, stereotyping (Hamilton, 1981).
- The problem solving capacity of the group as a whole and the single group members will be influenced in different ways by the groups' context (P_C). Mental influences are e.g. demands, norms, culture and power relations. Physical influences can be exerted by weather, failing deliveries, accidents etc.
- Side-effects (P_E) of the problem solving process which can be negative or positive.
- Dynamic, i.e. time-related, problems due to change and development (P_D). Ongoing processes will gradually change the problem and the conditions surrounding them.

Figure 1 (b) expresses the relation between the *task to solve*, P_T' , and the *trouble or inconvenience*, P_T . While P_T was the reason to enter into a problem solving activity in the first place, P_T' is the problem or *task* that has to be solved in order to get rid of the inconvenience.

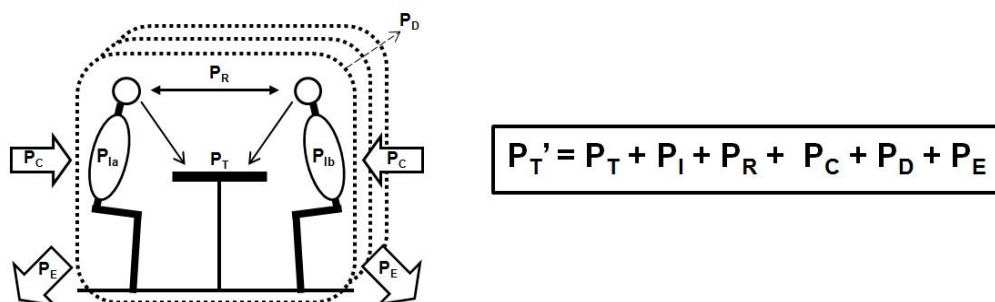


Figure 1 a) The problem-solving situation. B) The problem component 'formula'.

The Individual – Causes for Inadequate Performance

When looking for explanations to the problems in the construction sector the starting point has been four explanations a lay person often uses when attributing causes to other people's failures. The four chosen categories chosen are: they a) *did not understand how to (NU)*; b) *did not want to (NW)*; c) *did not dare to (ND)* or; d) *were not able to (NA)* solve the formulated problem.

NU: This category refers to an inadequate or incomplete *mental model* in a specific moment (Johnson-Laird 2004). It can be inadequate or incomplete in different ways. Here, the information distorting mental mechanisms discussed earlier play an important role.

NW: This category relates to different theories of motivation and drivers (e.g. Pritchard and Payne 2003; Deci & Ryan 2002; Oyedele 2010, 2013). People have innumerable different actions to choose from in a specific moment, and there are reasons why a specific choice is made. Both logical thinking and emotions are involved.

ND: One reason for not doing the 'right thing' is fear. Fear is an important mechanism that protects people from doing things that can be fatal in one way or another (Dozier 2000). There is instant fear appearing in the situation, there is anxiety that can be explained as fear for something happening elsewhere or in the future, and there is the fear of experiencing abhorrence or losing control (McWilliams 2011).

NA: Let us say that a person understands how to do the 'right thing', wants to do it, and dares to do it, but still it is not happening, then the person is not able to do it. Being able to do something depends on a person's knowledge, practical skills and available resources in a specific situation. In this category, knowledge stands for divided and delimited chunks of operable knowledge within different areas, whereas more integrative strategic knowledge or insights belong to the first category related to understanding.

Other reasons: For our purpose, the four above categories have been considered to comprise all human causes to inadequate performance. This means that other causes, as for instance 'I am not allowed' or 'I am too tired' etc., should be placed under the four categories. For example, the first can be placed under 'do not dare' implying that the individual has a choice. The second can be placed under 'do not want to' or 'is not able to', depending on how exhausted the person is.

The Interpretation and Information Distortion

The 'lasting impression' of the investigators quoted earlier (Byggkommissionen 2002), indicates some form of information distortion. There is agreement as to the existence of information distortion among different psychological traditions. However, they have different explanations of the underlying causes and, as a consequence, also how to deal with their negative effects. For example, the psychodynamic tradition focuses on unconscious psychological defence mechanisms (McWilliams 2011), cognitive psychologists point at people's limited information processing capacity (Reason 2007), while the socio-psychological tradition refers to techniques such as social attribution (Malle 2004, Barazova & Hancock 2012), and social stereotyping (Hamilton 1981). Psychological defence mechanisms are designed to help a person escape from anxiety that otherwise could emerge in embarrassing or threatening situations. Social attribution means that people ascribe identity and traits to other people (even to themselves) and reasons for their behaviour. However, attribution comes with a number of attribution errors, e.g. the fundamental attribution error (Ross 1977) and the superiority bias (Hoorens 1993). The fundamental attribution error is a tendency for observers to overestimate the causal influence of personality factors on behaviour and to underestimate the causal role of situational influences. The superiority bias, also known as the "better-than-average-effect", is a tendency to overestimate one's own positive qualities in relation to others', and underestimate the negative. The gap between 'espoused-theory' and 'theory-in-use', earlier mentioned, is also associated with what Argyris et al. (1985) call a kind of 'blindness' that makes the individual unable to detect the gap. Kahneman (2011) reports on a similar kind of 'blindness', where he describes the human mind as consisting of two parallel thinking systems. System 1 is fast, intuitive and energy-efficient; it is rather accurate most of the time but sometimes makes serious misinterpretations. System 2, on the other hand, representing effortful thinking, is slow, deliberate and energy-consuming. Kahneman has shown that people often are reluctant to engage system 2, because of its strenuous character.

Research Method

Questionnaire - based Survey

Since we were trying to find explanations for the situation within a whole industrial sector, we had to assure ourselves that the results of our investigation not only reflected local conditions. That means that we needed to reach out to different parts of the country, different types of organisations, different types of individuals etc. Since we were also looking for ideas that could explain why people continually are designing and carrying out actions that will lead to faults and criticism in a later stage, we needed to address the single individuals who carry out the actions. According to Bryman (2001), a questionnaire survey best meets the above requirements. Below, the design of the questionnaire and the principles for data analysis, the sample and the manner of distribution are presented.

The aim of the questionnaire was to investigate:

1. the problem apprehension of actors in the construction sector;
2. the actors' problem attention;
3. the specific individual or situational factor - if any – that can explain the apprehended problems; and
4. the presence of information distortion.

Design of the Questionnaire

In order to be able to study separately, in more detail, the influence of the different situational and individual factors that determine the conditions for human action design, a question generator was developed. This was done by combining the two models earlier presented, i.e. the situational problem components (P_T , P_I , P_R , P_C , P_D and P_E) and the causes for inadequate performance (NU, NW, ND, NA) into a 24-frame matrix (see Figure 2).

Individual attention, 4:						
Sector attention, 3:						
Occurrence, 2:						
Importance, 1:	P_T	P_I	P_R	P_C	P_D	P_E
NU (<i>Do not understand</i>)	1	5	9	13	17	21
NW (<i>Do not want to</i>)	2	6	10	14	18	22
ND (<i>Do not dare</i>)	3	7	11	15	19	23
NA (<i>Not able to</i>)	4	8	12	16	20	24

Figure 2 The question generator, relating situational problem components to causes for inadequate performance, including the four aspects
(importance, occurrence, sector attention and individual attention).

The matrix was then used to identify 24 different phenomena, relevant to the problems in the construction sector by asking: ‘what in the actual situation component might evoke the actual cause of inadequate performance?’ The first phenomenon was thus defined by asking ‘What in P_T (i.e. in the trouble or the technical issues) might cause the person to *not understand* how to act adequately?’ The question was answered: ‘*unclear target/problem formulation*’. The 24 phenomena generated in this way are presented in Table 1.

- 1 unclear target/problem formulation
- 2 the case that someone does not want execute specific work tasks
- 3 the case that someone experiences a risk to be injured
- 4 lack of skills in the working team
- 5 the case where people are trying to avoid threats or embarrassment
- 6 the case where a person is not interested in the problem being solved
- 7 fear of making mistakes or faults
- 8 the case where it is difficult to prioritize among different tasks
- 9 the case where people disagree in the team
- 10 doubt if all team members have fulfilled their part of the agreement
- 11 negative critique from other team members
- 12 insufficient/inefficient communication in the working team
- 13 misunderstanding of external working prerequisites/conditions
- 14 cultural barriers/considerations
- 15 fear of negative attitudes from people outside the team
- 16 too many or conflicting demands
- 17 insufficient information about changed conditions
- 18 defensive attitude (“sitting-on-the-fence”)
- 19 fear of the unknown
- 20 insufficient education in relation to change
- 21 insufficient/lack of a comprehensive view
- 22 the case where one has to take part in something that conflicts with one's will or conviction
- 23 insecurity regarding possible negative consequences that can not be foreseen
- 24 earlier decision/measures block optimal behaviour/acting

Table 1 The 24 phenomena, each representing a unique combination of the problem-solving situation and reasons why individuals do not act in an anticipated rational way

The 24 phenomena were then used to generate questions concerning four specific aspects of each phenomenon: 1) its importance, 2) its occurrence, 3) the attention paid to it in daily work in the construction sector; and 4) the attention paid to it in daily work by the individual respondent; in all $4 \times 24 = 96$ questions (see Figure 2). Thus, the four questions concerning the first phenomenon read:

Importance (1:1): What negative effects on effective, common value creation has: *unclear target or problem formulation*?

Occurrence (2:1): To what extent exists, in today's construction practice: *unclear target or problem formulation*?

Sector attention (3:1): To what extent does the construction sector preventively address: *unclear target or problem formulation*?

Individual attention (4:1): To what extent do you yourself preventively address: *unclear target or problem formulation*?

Since we are looking for contradictions and inconsistencies, one issue in the design is to prevent adjustment or 'balancing' of previously answered questions. This was achieved by presenting the questions, one by one, in a specific order.

Analysis of the Results

The questions were answered on a five-point Likert-scale with the answer alternatives: 1. No/Very small; 2. Small; 3. Moderate; 4. Large; 5. Very Large. Because every question had to be answered to enable the fixed presentation order, the Likert-scale was extended with three administrative answer options: 6. I do not know; 7. I do not understand (the question); 8. The question is not relevant. The responses were processed and analysed in the following ways:

I. A *frequency analysis* was performed to get information about the distribution of the different answers regarding importance, occurrence, sector attention and individual attention.

II. A *relevance index* was calculated for each phenomenon by multiplying the importance of a phenomenon with its occurrence, i.e. by multiplying the answer value (1-5) for the two aspects. The rank order of each of the investigated phenomena with respect to its *arithmetic mean of the relevance index* ($n = \text{valid answers}$) was calculated:

$$\left(\sum_{i=1}^{i=n} [\text{importance}(i) * \text{occurrence}(i)] \right) / n$$

III. In order to look for information distortion, each respondent's answers regarding *the sector's attention* and the *individual's own attention* concerning the 24 statements were compared.

IV. From a rational point of view it could be expected that high attention is directed to phenomena of high relevance and low attention to phenomena of low relevance, from both individuals and from the sector. Eight cases of different combinations of relevance, sector attention and individual attention are possible (see Table 2). Case 1 and 8 represents what can be considered as rational behaviour, while the rest indicate some kind of mismatch. A Pearson Chi-square¹ analysis was used in order to analyse the difference between *observed* and *expected* frequencies² for each phenomenon and case. Since the cases represent different mismatches we are interested in finding those that more people than expected experience. Note that we are not looking for the chi-square value per se.

Case	Relevance	Sector attention	Individual attention
1	High	High	High
2	High	Low	High
3	High	High	Low
4	High	Low	Low
5	Low	High	High
6	Low	Low	High
7	Low	High	Low
8	Low	Low	Low

Table 2 Eight possible combinatorial consequences of the respondents' opinions of the conditions in the construction sector.

V. Another way of understanding the results, looking behind the respondents' overt answers, is to bring them back to the two dimensions of each aspect of the question generator in Figure 2, i.e. *situational problem component* and *cause for inadequate performance*, to see if any pattern emerges. Does any individual cause or situational component stand out compared to the rest? This is done by completing the ranking tables of Importance, Occurrence, Relevance, Sector attention and Individual attention (in Table 3) with their coding for situational problem component and cause for inadequate performance.

Sample

The questionnaire was distributed to a representative sample of white-collar personnel working in different positions in the construction sector in Sweden. The membership lists of three influential 'white-collar' branch organisations were used: a) the Swedish Society of Civil and Structural Engineers, SVR (612 respondents); b) the Swedish Association of Construction Engineers, SBR (554 respondents); and c) the Swedish Association of Architects, SA (566 respondents).

Together, the three organisations have about 15,000 members (SBR 2700; SVR 4000; SA 11,500 of which only the categories SAR/MSA and A MSA, relating to building architects, were used) which roughly correspond to about 10% of all architects and engineers active within the construction sector. However, there are differences between the organisations. SA is a trade union and has enrolled about 90% of all architects, while SBR and SVR are more interest-based and organise a much smaller part of the total number of engineers. A random number generator was used to select page numbers in the membership lists. Each person on a selected page having an e-mail address and, in the case of architects, the right categorisation was included in the sample.

Distribution Method

Inquiries were sent via email with instructions on how to login and answer the questionnaire. This invitation was followed-up by three reminders, with one week's interval, to those who had not returned the completed questionnaire after two weeks.

Response Frequency

In all, 304 responses were received. Due to the low response rates (~20%) a dropout analysis was performed on 284 randomly-selected people who had not answered the questionnaire and who were then contacted by telephone. It was found that 24.3% of the respondents did not receive the login instructions due to invalid e-mail address, 2.5% were not available at the time for the survey, and 7.7% could not be traced at all whereas 18.7% did not work in the construction sector, and therefore did not belong to the target group. Furthermore, 33.8% had received the questionnaire and found it interesting but could not allot the time needed to answer it, 6.0% were not interested in participating and 1.8% had

lost their login information. The remaining 5.2% referred to the questionnaire layout, personal values, insufficient secrecy routines or technical problems as reasons for not answering the questionnaire. A re-estimation of the response rate based on the results of the dropout analysis indicated that the 304 answers correspond to ~52% of the 'valid' respondents, which corresponds to 'barely acceptable' in Mangione's (1995) categorisation.

Survey Results

Ranking of the 24 Phenomena

As earlier explained, the questionnaire was used to obtain two kinds of result, the respondent's direct answers and combinations or comparisons of the direct answers. A frequency analysis was performed to get information about the distribution of the different answers. The result is presented in Table 3, in the form of ranking tables. A low number indicates a high ranking, i.e. an important or frequently occurring phenomenon or phenomenon attracting high attention.

Situational problem component	Individual cause	Phenomenon	Direct Answers				Combined Answers			
			Importance	Occurrence	Sector attention	Individual attention	Relevance	Sector attention - Individual attention	Case 2	Case 5
PT NU		1 unclear target/problem formulation	1	3	3	1	1	1	4	4
PT NW		2 the case that someone does not want execute specific work tasks	9	21	18	16	12	11	24	8
PT ND		3 the case that someone experiences a risk to be injured	12	17	1	6	14	24	23	5
PT NA		4 lack of skills in the working team	5	10	5	11	7	12	3	3
PI NU		5 the case where people are trying to avoid threats or embarrassment	19	19	23	22	18	20	20	18
PI NW		6 the case where a person is not interested in the problem being solved	4	20	11	9	11	8	12	2
PI ND		7 fear of making mistakes or faults	14	14	17	18	15	17	15	13
PI NA		8 the case where it is difficult to prioritize among different tasks	15	5	15	10	9	5	7	24
PR NU		9 the case where people disagree in the team	6	7	10	7	5	3	9	17
PR NW		10 doubt if all team members have fulfilled their part of the agreement	16	15	8	15	17	15	21	10
PR ND		11 negative critique from other team members	17	23	19	21	23	19	17	12
PR NA		12 insufficient/inefficient communication in the working team	2	6	4	3	3	7	6	19
PC NU		13 misunderstanding of external working prerequisites/conditions	7	11	6	4	8	6	11	15
PC NW		14 cultural barriers/considerations	20	22	22	19	21	16	2	11
PC ND		15 fear of negative attitudes from people outside the team	23	24	24	24	24	23	19	22
PC NA		16 too many or conflicting demands	10	2	7	8	6	9	16	1
PD NU		17 insufficient information about changed conditions	3	4	2	2	2	4	5	6
PD NW		18 defensive attitude ("sitting-on-the-fence")	18	12	16	20	13	21	13	9
PD ND		19 fear of the unknown	22	13	21	23	19	22	14	23
PD NA		20 insufficient education in relation to change	24	8	9	12	22?	14	22?	21?
PE NU		21 insufficient/lack of a comprehensive view	8	1	14	5	4	2	1	16
PE NW		22 the case where one has to take part in something that conflicts with one's will or conviction	11	18	20	14	16	10	10	14
PE ND		23 insecurity regarding possible negative consequences that can not be foreseen	21	16	12	17	20	18	18	7
PE NA		24 earlier decision/measures block optimal behaviour/acting	13	9	13	13	10	13	8	20

Table 3 The 24 phenomena ranked with respect to the four aspects and combinations or comparisons of them.

* The 'Importance' of phenomenon 20, marked with an asterisk is considered flawed since 145 out of 304 respondents (43.2%) marked answer alternative 7. I do not understand (the question). This indicates that this particular question was inadequately formulated and should therefore be handled with caution. The combined answers regarding relevance, case 1 and case 2, marked with question marks should also be considered as flawed since they build on the same answer.

In Table 3 the third column shows the list of phenomena. To the left, each phenomenon is marked with its code for situational problem component and cause for inadequate performance according to Figure 2. To the right of the list of phenomena is the ranking table for each investigated aspect, grouped in two clusters. The first, "Direct Answers" represents the answers to the questions concerning the phenomenon's importance, occurrence, sector

attention and individual attention. The second cluster, "Combined Answers," shows the result of the comparisons of the answers processed by the authors according to the earlier described analyses II, III and IV.

In a practical context the most highly-ranked phenomena are the most salient and probably also the ones with the highest potential to make a difference. To make it easier to distinguish those, the six (25%) most highly-ranked phenomena in each aspect of the investigation have been framed with a thick-line.

Respondents' Direct Answers

The rankings in the 'Direct Answers'-columns of Table 3 are based on the respondents' given answers in regard to the four aspects of importance, occurrence, sector attention and individual attention.

Importance: The six phenomena of highest importance are thus (in ranking order): 1. unclear target/problem formulation; 12. insufficient/inefficient communication in the working team; 17. insufficient information about changed conditions; 6. the case where a person is not interested in the problem being solved; 4. lack of skills in the working team; 9. the case where people disagree in the team.

Occurrence: The six phenomena of highest occurrence are (in ranking order): 21. insufficient/lack of a comprehensive view; 16. too many or conflicting demands; 1. unclear target/problem formulation; 17. insufficient information about changed conditions; 8. the case where it is difficult to prioritize among different tasks; 12. insufficient/inefficient communication in the working team.

Sector attention: The six phenomena of highest perceived sector attention are (in ranking order): 3. the case that someone experiences a risk to be injured; 17. insufficient information about changed conditions; 1. unclear target/problem formulation; 12. insufficient/inefficient communication in the working team; 4. lack of skills in the working team; 13. misunderstanding of external working prerequisites/conditions.

Individual attention: The six phenomena of highest perceived individual attention are (in ranking order): 1. unclear target/problem formulation; 17. insufficient information about changed conditions; 12. insufficient/inefficient communication in the working team; 13. misunderstanding of external working prerequisites/conditions; 21. insufficient/lack of a comprehensive view; 3. the case that someone experiences a risk to be injured.

Combined Answers

Relevance: A *relevance index* was calculated for each phenomenon by multiplying the importance of a phenomenon with its occurrence, i.e. by multiplying the answer value (1-5) for the two aspects. The ranking can be seen in Table 3. The six most relevant phenomena are: 1. unclear target/problem formulation; 17. insufficient information about changed conditions; 12. insufficient/inefficient communication in the working team; 21. insufficient/lack of a comprehensive view; 9. the case where people disagree in the team; 16. too many or conflicting demands.

Sector and individual attention: In order to look for information distortion, each respondent's answers regarding *the sector's attention* and the *individual's own attention* concerning the 24 statements were compared. Three kinds of result are possible: (1) the respondent finds the sector more attentive; (2) the respondent finds himself/herself more attentive; and (3); the respondent finds himself/herself and the sector equally attentive. The outcome is shown in Table 4. The table header shows the ranking. The first row shows the phenomena in ranking order. The second row shows the number of respondents who perceive the sector paying

more attention to the particular phenomenon than they are themselves. The third row shows, conversely, the number of respondents finding themselves being more attentive than the sector. The fourth row shows $\Delta = (\text{row 3} - \text{row 2})$, which also determines the ranking.

Phenomenon	High ranking												Low ranking											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Sector more attentive	17	26	24	24	26	28	37	28	24	25	32	36	33	46	41	50	51	44	49	32	50	60	60	78
Individual more attentive	182	186	173	171	172	171	177	167	161	150	140	143	131	128	121	127	126	118	113	95	110	98	77	93
Δ	165	160	149	147	146	143	140	139	137	125	108	107	98	82	80	77	75	74	64	63	60	38	17	15

Table 4 Comparison between the responses to aspect 3: about the sector’s attention and the responses to aspect 4: about the individual respondent’s attention. All aspects can be seen in Figure 2.

Since the sum of the individuals equals the sector there should ideally be no gap. Yet, in every comparison Δ is positive, meaning that the individuals are perceiving themselves to be more attentive than the sector. The six phenomena earlier considered as the most relevant have been marked with thick lines in the first row. The six phenomena showing the largest difference (Δ) are: 1. unclear target/problem formulation; 21. insufficient/lack of a comprehensive view; 9. the case where people disagree in the team; 17. insufficient information about changed conditions; 8. the case where it is difficult to prioritize among different tasks; 13. misunderstanding of external working prerequisites/conditions.

Comparison between relevance and attention: In order to see if due attention is directed towards the most relevant phenomena, the deviation between observed and expected frequencies for the six (2-7) mismatching cases in Table 2 was calculated using a Pearson Chi-square analysis. The result is shown in Table 5.

Case 2			Case 3			Case 4			Case 5			Case 6			Case 7		
Ph.	O-E	O/E	Ph.	O-E	O/E	Ph.	O-E	O/E	Ph.	O-E	O/E	Ph.	O-E	O/E	Ph.	O-E	O/E
21	17,95	1,60	7	1,89	0,68	9	1,86	1,18	16	11,30	1,48	20	-1,40	0,94	21	4,34	1,65
14	6,65	2,24	23	1,20	-2,85	1	1,84	1,26	6	10,50	1,43	23	-6,04	0,81	19	0,90	1,06
4	6,59	1,63	5	0,94	1,05	2	1,55	1,16	4	9,99	1,40	5	-6,09	0,76	15	-0,11	0,98
1	6,37	1,26	8	0,88	0,86	15	0,65	1,15	1	9,51	1,35	7	-6,37	0,78	20	-0,48	0,94
17	6,32	1,28	11	-0,17	-0,38	12	0,06	1,01	3	9,49	1,12	19	-7,13	0,66	8	-0,97	0,92
12	6,21	1,33	20	-0,18	-2,31	6	-0,25	0,96	17	8,06	1,23	15	-7,54	0,48	17	-0,99	0,92
8	6,19	1,37	15	-0,20	-9,93	11	-0,68	0,88	23	7,64	1,67	24	-7,59	0,78	24	-1,19	0,92
24	4,19	1,54	2	-0,61	2,14	20	-0,72	0,00	2	7,35	2,11	3	-8,32	0,70	1	-1,99	0,75
9	3,47	1,24	18	-0,63	0,22	3	-0,85	0,54	18	7,19	2,24	17	-10,39	0,71	12	-2,29	0,85
22	3,15	1,54	14	-0,89	-0,09	7	-1,51	0,88	10	6,97	1,35	1	-10,60	0,64	13	-4,10	0,79
13	2,67	1,24	19	-1,11	-0,35	13	-1,63	0,79	14	5,43	1,97	11	-10,67	0,71	10	-4,82	0,81
6	2,37	1,25	24	-1,21	-1,25	24	-1,72	0,85	11	5,41	1,71	22	-10,93	0,78	9	-5,67	0,64
18	1,52	1,34	12	-1,28	0,76	8	-2,00	0,89	7	5,04	2,01	18	-11,02	0,54	22	-5,82	0,63
19	1,23	1,44	6	-1,60	0,90	22	-2,06	0,80	22	4,81	1,52	8	-11,60	0,73	7	-6,28	0,61
7	1,19	1,31	22	-1,89	-2,45	4	-2,19	0,79	13	4,63	1,16	12	-12,48	0,68	3	-6,70	0,86
16	0,99	1,05	9	-2,48	0,81	19	-2,35	0,82	21	4,59	1,40	9	-12,84	0,75	14	-6,78	0,51
11	-0,07	0,97	4	-2,68	1,10	17	-2,78	0,64	9	3,56	1,16	2	-13,02	0,67	5	-6,78	0,13
23	-0,31	0,87	13	-3,64	0,57	10	-2,84	0,58	5	3,10	2,63	10	-14,67	0,58	2	-6,98	0,50
15	-0,41	0,00	21	-3,77	-0,05	16	-2,85	0,79	12	1,87	1,06	6	-15,89	0,73	4	-7,47	0,69
5	-0,41	0,88	10	-3,95	0,62	23	-4,08	0,20	24	1,54	1,16	14	-15,99	0,59	11	-7,81	0,62
10	-0,52	0,91	3	-4,25	1,29	18	-5,02	0,67	20	0,80	1,13	16	-16,85	0,57	6	-7,90	0,50
20	-0,53	0,00	16	-5,45	0,72	21	-6,53	0,63	15	0,33	1,50	21	-16,95	0,60	16	-8,26	0,52
3	-1,01	0,66	1	-5,65	1,28	5	-6,94	0,50	19	-0,35	0,90	13	-17,65	0,62	18	-8,47	0,56
2	-1,50	0,67	17	-6,68	0,64	14	-7,23	0,45	8	-2,12	0,83	4	-18,11	0,52	23	-9,02	0,64

Table 5 Ranking of the different phenomena/statements in respect of case 2-7 based on observed frequencies (O) minus expected frequencies (E).

Note that phenomenon 20 is probably flawed.

Case 2 and Case 5 (in Table 2) show the most salient deviation (i.e. largest positive values). Case 2 represents phenomena that a respondent estimates to be of *high relevance* and to which he/she at the same time considers him/herself to direct a *high degree of attention* while the sector is considered to direct a *low degree of attention*. The six phenomena with the largest deviation (in the black square) are: 21. insufficient/lack of a comprehensive view; 14. cultural barriers/considerations; 4. lack of skills in the working team; 1. unclear target/problem formulation; 17. insufficient information about changed conditions; 12. insufficient/inefficient communication in the working team.

Case 5 represents phenomena of estimated *low relevance* where both the individual and the sector direct a *high degree of attention*. The six phenomena with the largest deviation (in the black square) are: 16. too many or conflicting demands; 6. the case where a person is not interested in the problem being solved; 4. lack of skills in the working team; 1. unclear target/problem formulation; 3. the case that someone experiences a risk to be injured; 17. insufficient information about changed conditions.

Some of the phenomena can be found high in both case 2 and case 5 (1, 4 and 17) which indicate that the sector is divided into different camps.

Pattern regarding cause and problem component: In order to see if any particular situational problem component or individual cause for inadequate behaviour stands out, according to analysis V, the ranked lists of Importance, Occurrence, Relevance and Attention, in Table 6, has been completed with their coding for “cause for inadequate behaviour” (NU, NW, ND and NA) and “situational problem component” (P_T, P_I, P_R, P_C, P_D, P_E). To make it easier to distinguish any pattern, the initial letter has been removed in the table, i.e. NU=U, PT=T and so on.

	High ranking												Low ranking											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
a) Importance	1	12	17	6	4	9	13	21	2	16	22	3	24	7	8	10	11	18	5	14	23	19	15	20
Cause	U	A	U	W	A	U	U	U	W	A	W	D	A	D	A	W	D	W	U	W	D	D	D	A
Component	T	R	D	I	T	R	C	E	T	C	E	T	E	I	I	R	R	D	I	C	E	D	C	D
b) Occurrence	21	16	1	17	8	12	9	20	24	4	13	18	19	7	10	23	3	22	5	6	2	14	11	15
Cause	U	A	U	U	A	A	U	A	A	A	U	W	D	D	W	D	D	W	U	W	W	W	D	D
Component	E	C	T	D	I	R	R	D	E	T	C	D	D	I	R	E	T	E	I	I	T	C	R	C
c) Relevance	1	17	12	21	9	16	4	13	8	24	6	2	18	3	7	22	10	5	19	23	14	20	11	15
Cause	U	U	A	U	U	A	A	U	A	A	W	W	W	D	D	W	W	U	D	D	W	A	D	D
Component	T	D	R	E	R	C	T	C	I	E	I	T	D	T	I	E	R	I	D	E	C	D	R	C
d) Attention	3	17	1	12	4	13	16	10	20	9	6	23	24	21	8	18	7	2	11	22	19	14	5	15
Cause	D	U	U	A	A	U	A	W	A	U	W	D	A	U	A	W	D	W	D	W	D	W	U	D
Component	T	D	T	R	T	C	C	R	D	R	I	E	E	E	I	D	I	T	R	E	D	C	I	C
e) Individuals	1	17	12	13	21	3	9	16	6	8	4	20	24	22	10	2	23	7	14	18	11	5	19	15
Cause	U	U	A	U	U	D	U	A	W	A	A	A	A	W	W	W	D	D	W	W	D	U	D	D
Component	T	D	R	C	E	T	R	C	I	I	T	D	E	E	R	T	E	I	C	D	R	I	D	C

Table 6 Coding regarding cause for inadequate behaviour and situational problem component. In order to make it easier to discern any pattern just the distinguishing letter for cause and problem component is used so that e.g. U=NU=do not understand and T=PT=trouble/inconvenience.

Table 6a regarding *importance* shows a pattern in cause where NU, i.e. do not understand, is generally highly ranked and ND, i.e. do not dare to, has a low overall ranking. No clear pattern can be established regarding the problem component in the same way. Table 6b

shows that the cause of *high occurrence* can be derived from both NU and NA, i.e. 'are not able to' and phenomena linked to ND and NW, i.e. 'do not want to', attract a low ranking. Concerning problem components, PI tends to have a low ranking. The *relevance* index in Table 6c corresponds with the tendency regarding cause in Table 6b, while the problem components are evenly distributed. When it comes to *sector attention*, in Table 6d, the tendency in cause recurs, except for a ND in the highest ranking, representing the sector's high attention on 'the case that someone experiences a risk to be injured.' In problem component there is a clear emphasis of PT in high rank and a cluster of PE in the middle of the span but it is otherwise evenly distributed. In the last table, Table 6e, *individual attention*, there is again repetition in cause and a non-specific pattern in problem component.

Discussion

Results

We asked white-collar personnel in the Swedish construction sector about their views on certain problems and conditions in their daily work. The question about how practitioners in the Swedish construction sector assess different problems and conditions in their daily work, is answered by the questionnaire and presented in Table 3. Among the six most relevant problematic phenomena, i.e. phenomena that are both important and frequent, three can be related to leadership outside the working team, i.e. 1. unclear target or problem formulation; 17. insufficient information about changed conditions and; 16. too many or conflicting demands. One can be related to both leadership and the working team, i.e. 21. insufficient or lacking comprehensive view. The remaining two can be related to the working team i.e., 12. insufficient communication in the working team and; 9. the case where people disagree in the team.

The first, and most salient of all problem components, 1. unclear target or problem formulation, indicates a missing link between rhetoric and action. A clear vision, goal or objective is central in several problem solving or change methods (Kanter et al. 1992; Kotter 1996; Luecke 2003). According to the respondents, this is obviously not the case in practice. From the answers in the questionnaires, it is not however possible to conclude why the target or problem formulation is regarded as unclear. This has to be further investigated.

The presence of patterns in the way practitioners in the construction sector perceive their situation and that can explain certain problems, may to some extent be revealed by the questionnaire. There are some contradictions in the material that might indicate inconsistencies. The most obvious comes from the comparison of the single individual's appraisal of his/her own attention to important issues and his/her appraisal of the whole sector's attention to the same issue. In all 24 phenomena, there are more individuals thinking that they are more attentive than the sector as a whole. Since individuals constitute the sector the answers should be in balance. Although the result, per se, is not too surprising, given well-known human traits such as e.g. the superiority bias (Hoorens 1993), there is still a risk that this misleads the conception of reality and hinders exchange of correct information. The difference is especially clear when it comes to the most relevant phenomena, where the six most relevant are situated among the nine showing the highest difference in attention. This result lends some support and explanation to the Bygghälskommissionen (2002) investigators' impression that individuals in the sector neither see themselves as part of, nor the solution to, the sector's problems. If this is true, it alone could explain the much criticised inertia in the sector.

Furthermore, do the answers to the questionnaire reveal if some prerequisite component is missing? When the answers are brought back to the situational dimension in the question generator it appears that the technical component (P_T) and the relational component (P_R) are considered the most relevant and are the two most noted by both the sector and the

individuals. However, the answers are quite evenly distributed among all the six components, which support the use of the extended problem formulation in Figure 1 (b).

Do the answers to the questionnaire reveal if psychological factors, e.g. information distortion, might influence the way problems are perceived? When brought back to the dimension of causes of inadequate performance, there is a more salient division into two groups, where 'Do not understand' and 'Are not able to' dominate in relevance as well as in both sector and individual attention. 'Do not dare to' and 'Do not want to' are constantly ranked low suggesting that the respondents do not consider those aspects as particularly relevant and therefore do not pay much attention to them. This indicates that additional efforts should not be spent on merely motivational events, but rather on information, communication, education and enhancing equipment that can raise the individuals' performance capacity, which in itself is motivating.

When comparing relevance and attention, most cases seem to be in accord. There are, however, exceptions in case 2, i.e. issues of high relevance to which the sector is considered to pay little attention while individuals pay high attention, and in case 5, i.e. issues of low relevance to which both the sector and the individuals pay high attention. A situation, where the individual experiences that 'the others' do not direct proper attention to a relevant phenomenon, or that both the sector and individuals are directing high attention to phenomena that are considered to be of low relevance, might provoke tensions, e.g. frustration, apathy or mistrust, which could influence communication and cooperation negatively.

Limitations

Even though questionnaire-based surveys are a well-established form of inquiry, two features here can be regarded as somewhat unorthodox – the question generator and the combinatorial procedure. *The question generator* was of significant help in formulating each question. This strict question formulation procedure meant that answers could be coded in order to detect underlying patterns in cause or situation.

It should be noted though, that the conclusions made about individual causes for inadequate performance and situational problem components results lean heavily on the correlation between one single question and the referred phenomenon. Here, it was considered to be sufficient with one question because the aim was not to find some evidence-based 'truth' but rather probe for new ideas as input into our learning cycle and method development. The ranking of the phenomena per se, and the contradiction between sector attention and individual attention, is more straightforward and therefore not associated with such interpretative risk.

What is perhaps the most interesting aspect of the combinatorial procedure is the chance to look behind the answers given by the respondents by combining them in different ways. In this way, inconsistencies or contradictions in the respondents' view of reality can be identified. However, it can be difficult to define the combinatorial consequences in a perfectly correct manner, which is why the results should be handled with both care and caution. But if this is done properly, it can generate outcomes that can be hard to achieve otherwise.

In this investigation the random sample represents a cross section of the construction sector. However, it does not tell if there are local variations. For example, newcomers may see the situation differently than more experienced colleagues, client side representatives differently than entrepreneurs and managers of large projects differently from managers of small projects.

Conclusions

One central idea in this investigation has been that it is individuals' actions that lead to the results that are so often criticised. We have assumed that an individual's actions are conclusively influenced by his/her inner mental constructs and appreciation of the situation at any given time. This appreciation is not a hard copy of reality, but rather a personal interpretation based on memories, fragmented perceptions and inner aptitude. The investigation has shed some light on what individuals think about phenomena in their daily practice and which probably will influence their action design, consciously or unconsciously.

First, the result shows that it is necessary that problem definitions are widened to include the problem solving situation per se with its combination of individual, relational, contextual and dynamic factors. This is easy to overlook, but is essential when designing measures that should lead to intended results. Such an expanded problem view is however at risk of becoming limitless from a comprehensive theoretical perspective and is, thus, impossible to manage in a practical situation. In such a practical problem solving situation, relevant factors only should be handled. Here, the individual-situation matrix, or question generator, see Figure 2, can be of help in methodically finding relevant factors to a particular problem solving situation.

Second, the emerging picture shows that the workforce has the ambition and courage to do what is expected but does not always have adequate information and the ability or resources to do it. However, the result also indicates the existence of some kind of information distortion that might affect the way they understand the world.

Third, the approach taken in this study appears to have the potential for looking behind the façade, by detecting different kinds of contradictions. Investigations that attempt to understand how people design their actions and why they do not perform as anticipated, starting in their daily routine, could provide valuable complementary information as a basis for performance development and change in the sector.

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Explanatory Notes

¹ Pearson Chi-square = $\chi^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i}$ where O refers to *observed frequencies* and E to *expected frequencies*².

² *Expected frequencies* are calculated using the multiplication rule of probability. The multiplication rule says that the probability of the occurrence of two independent events X and Y is the product of the individual probabilities of X and Y.