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Perception gap and its impact on supply chain performance

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Abstract: The main purpose of this paper is to frame the perception differences between the buyer and supplier on the supply chain's operational delivery, and to investigate their causal relation to the overall supply chain performance. A conceptual *three-level model* is developed to theorise the structural existence of the perception gaps in primarily a dyadic buyer-supplier setting. Using the primary data gathered through a major survey exercise, *confirmative factor analysis* and *structural equation modelling* were conducted to test the hypotheses on the significance and relevance of the perception gaps in supply chain management. This study provides a better conceptual understanding of the perception differences on the required as well as achieved operational deliveries within the supplier-buyer dyad, and reveals their significant and negative causal impact on the overall supply chain performance.

Keywords: perception gaps; supply chain performance management; supply chain integration.

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1 Introduction

In the competitive game of business, success often favours those who deliver the higher standard performances and higher value in the eyes of the end-consumers (Kim, 2009; Lee, 2000). A critical element in achieving such supply chain wide effectiveness is the alignment of individual contribution of every participating member of the supply chain at the strategic, tactical and operational levels (Lu, 2011a; Jayaram et al., 2010). Such alignment requires inter-organisational collaboration and integration to achieve optimised balance between cost and benefits, efforts and reward, investment and returns across the entire supply chain (Flynn et al., 2010; Fawcett and Magnan, 2002). It also calls for strategic alliance, high level of trust, and a culture of close partnership (Böhme et al., 2008; Swink and et al., 2007).

Despite the extensive literature coverage on a whole range of factors that might affect the supply chain performance and ultimately supply chain success (Lu, 2011b), one stone, which appears to have been left unturned, is the impact of *perception gap* in terms of the differences that the supplier and buyer are expecting from each other on whole range of the operational performance measures. To further clarify the notion of the term and to distinguish it from other similar meanings in other research fields such as psychology and philosophical (Strawson, 1988; Yaniv and Shatz, 1988; Brewer, 1996), we define a *narrow notion of perception gap* as:

“The discrepancies between buyers’ and suppliers’ perceptions on each other’s operational delivery standards and performances within any pair of supplier-buyer dyad of a supply chain.”

However, the definition can also be generalised into a more useful *wider notion* of perception gap as:

“The discrepancies between any participating members’ perceptions on what’s need to be or have been delivered, performed or achieved in the part of the supply chain.”

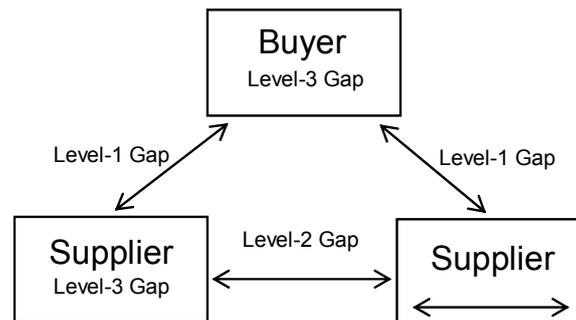
Thus, in this research, the perception gap is focused on the wider differences of opinion towards the operational performance that the other parties in the supply chain are supposed to deliver or have been delivering. Such a wider notion surely not only covers

the narrow notion, but also more importantly extends it from the dyadic fulfilment difference to a more general cognitive difference. Two suppliers of the same buyer may have different perceptions on the buyer's strategic intention for a newly developed product; even two divisions in the same supplier may show discrepancies on the perceptions of the intended quality standards by the buyer.

Our initial literature review shows that there is a clear paucity of scholarly discussion of the perception gap in the given research context. Even sparser are the literatures on how such perception gaps may have impacted upon the supply chain performance. However, the lack of literature in the area is only part of the motif for the research. The more important motif lies in the largely ignored theoretical relevance and causal relationship with overall supply chain performance. This theoretical shortfall could impede supply chain performance and obscure managers' thorough understanding of the root-cause of many supply chain management problems. It is, therefore, the authors' primary aim to fill this apparent research gap and to provoke more in-depth and exploratory discussion of the topic.

The premise of this research is largely based on the authors' hypothesised conceptual model in Lu et al. (2013) that the perception gap, in terms of wider definition, exists in three different levels. Considering any dyadic link between two tiers – the supplier tier and the buyer tier, the perception gap can be illustrated and framed by a *three-level gaps* model as shown in Figure 1. The *model* shows the different components of perception gaps within a dyadic pair. As one of the research findings, the analysis in the sequel has positively verified the significant existence of such perception gaps at all three different levels, albeit testifying the mere existence of the perception gap only fulfils a small part of the research objectives. What's more important is to explore and verify that the perception gaps at different levels may or may not impact upon the different aspects of supply chain behaviour. Supply chain performances are likely to be causally related to the different types of perception gaps. This leads to another set of hypotheses to be discussed in the later sections.

Figure 1 Three-level perception gaps model



The *level-1 perception gap* represents the perception difference in between suppliers and buyer on mainly what needs to be delivered to the buyer; the *level-2 perception gap* represents the discrepancies in between the different suppliers' perceptions on the intended quality standard and service level from the same buyer; and the *level-3 perception gap* represents the differences in between the different functions' or even different peoples' perceptions within the same supplier or buyer on what was required

and how they are performing in order to satisfy the external parties' demand (Lu et al., 2013).

The model basically defines the three categorised sources of perception gaps and maps them to their corresponding supply chain management problems, namely: level-1 gap is linked to the buyer-supplier coordination; level-2 gap is linked to the rationalisation within the supply base to achieve the consistency and harmony in between suppliers horizontally; level-3 gap links to the participating organisation's internal congruence and communication effectiveness. As such, arguably the model suggests a theoretical point that the supply chain behaviours in coordination and relationship are intricately related to a psychological dimensional measure called perception. Based on the comprehensive theory of perception proposed by Huron (2006), perceptions do directly evoke behavioural consequences in various forms of psychological phenomena. According to the theory, accurate expectations are adaptive mental functions that allow organisms to prepare for appropriate actions and perceptions; the emotions accompanying expectations are intended to reinforce accurate prediction, promote appropriate event-readiness, and increase the likelihood of future positive outcomes [Huron, (2006), p.4]. Thus it is fair to say when the perceptions are not formed from the accurate anticipation; they may evoke poor event-readiness and negative outcomes. The model could also provide guidance on linking from practical managerial problems to the possible root causes arising from the perception gaps. Avoiding extensive elaboration, the characteristics of the perception gaps and their implications in supply chain management can be described in Table 1 (Lu et al., 2013).

Table 1 The three-level gaps model and its implications

<i>Levels</i>	<i>Where</i>	<i>Descriptions</i>	<i>Implications</i>	<i>Remedies</i>
Level-1 gap	Between buyer and suppliers	SC requirement and fulfilment gaps	Impediments to supplier development and SC integration	Long term, close partnership; information sharing; joint planning
Level-2 gap	Between different suppliers in the same tier	Suppliers differentiation gaps	Hinders the optimisation of consistent quality and cost	Tailored relationship and bespoke processes and KPI to each type of supplier
Level-3 gap	Between people who may or may not have different roles.	Role-based perspective gaps	Barriers to internal operational coordination	Internal communication; adequate employee training; empowerment.

In spite of the relatively simple form of the definition intuitively understandable concepts, the implication of the perception gap and its possible causal relation with the supply chain performance remain unclear and un-investigated. Thus the following critical research questions need to be addressed:

- Is there any causal link between the perception gap and the key supply chain performance measures? Or is the perception gap a latent factor that affects the performance shortfalls significantly?
- How substantive is the impact of perception gap on the measured or observed supply chain performance?

- Is the perception gap an independent, unique and non-captive factor that needs to be recognised on a theoretical basis?

Hence, the *objectives* of this paper area follow:

- a to examine the significant existence of the latent factor called *perception gap* as defined above through observed indicators
- b to test the causal connection between the perception gaps as a model construct and the observed supply chain performances
- c to develop a better understanding on how perception gap plays its role in supply chain performances.

Furthermore, an unintended objective could be to explore a new research dimension where the established psychological and emotional behaviour theories such as ‘a comprehensive theory of expectation’ (Huron, 2006) can be applied into the domain of organisations and supply chains instead of organisms. It is therefore anticipated that the limited contribution of the article would be on constructing a psychological component into the underpinning theory of supply chain performance of integration. The *methodological design* taken to achieve these objectives is first, to construct empirical conceptual model based on the past collective knowledge and literature reviews, arguing the research gap and its deservedness for attention; second, to design the measurement instruments and collect first-hand data to form the observed indicators for the relevant constructs of the model; third, to test the model using the well-established multivariate statistical tools including confirmatory factor analysis (CFA) and structural equation modelling (SEM). We used IBM SPSS Amos 20 package to check the validity of the model constructs, analyse their relationship such as regression loadings, and try to come to terms of the causality from perception gap to supply chain performance.

The remainder of the paper is organised as follows. Section 2 provides a brief review of the relevant literature as the conceptual background, along with some critical discussions leading to hypotheses propositions. Section 3 discusses the methodological issues including the survey, the data collection, and the choices of analysis methods. Section 4 is devoted to the data analysis by using CFA and SEM. Section 5 summarises the findings from a theoretical perspective and discusses their managerial implications. Section 6 draws conclusive remarks from the research, outlines the limitations and foresees further works.

2 Literature review

The topic of *perception gap and its impact on supply chain performance* appear to have not yet formed a recognisable body of knowledge, nor have the researchers developed fundamental theorised models. Notwithstanding that *perception gap* and *supply chain performance* separately have already been widely discussed and researched in several different contexts. However focused research specifically investigating the significance and relevance of perception gap as defined in this research remains uncommon. For instance, a test-run of Google Scholar search on the combined terms of *perception gap* and *performances gap* returns no directly applicable result. Nevertheless, indirect studies in the related areas appear to have no shortage of literature evidences. Many of such

research outputs were largely in the field of psychology and philosophy. Liggio (1974) applied the term 'expectations gap' to auditing and how it might be live up to the public expectations to the business. Porter (1993) also ascribed to the expectation gaps in the context of increased litigation and the threat of lost governance. Sporadic research studies on perception gaps and their impacts on some specific business areas have brought some encouraging development in theory as well as tangible values in practice. For example, research conducted for the conceptual models of expectation gap have been seen in a number of literatures (Anderson et al., 1993; Lowe, 1994; Miller et al., 1991). Based on the definition given by Slack et al. (2009) in the field of operations management, the concept of 'expectation gap' is more or less the same as the "perception gap" which we use here in this paper.

In a very different research area of manufacturing, Silver and Vegholm (2009) discussed the issues of providing service to customers in order to meet their 'expectations'. The desired outcome of such dyadic relationship is the high standard of product and service quality that leads to customer satisfaction (Kessler, 1995; Betts et al., 2011). As a result of this interaction, the buyer will make evaluations based on its judgment of the product or service received from the suppliers, and will compare the performance with its initial expectations. The customers' perception is the behavioural outcome of their experience on the overall capability of the suppliers (Gagliano and Hathcote, 1994). Thus one can understand that the buyer's perception is based on its evaluation of the service received. When the perceived performances are lower than the expectations, it is a sign of poor service or product quality by the suppliers; and the reverse indicates good quality and service standard. The perception or the perceived quality is the overall judgment on the supplied products or services. However, prior to their experience, buyers create *expectations*, against which the supplier's performance is evaluated (Coye, 2004). Consequently, perceptions involve the subjective response of people and are therefore highly likely to be inconsistent with the reality or that of the supply chain partners (Parasuraman et al., 1985). All these observations from the literature serve as the empirical evidence for the possible existence and close relevance of the perception gaps with supply chain performance.

Looking further beyond, according to the *disconfirmation* theory, which is most widely used and accepted theory to explain satisfaction and service quality (Johnston, 1995; Johnston and Clark, 2008), the customer's feeling of satisfaction/dissatisfaction with his service encounter is related to the magnitude and direction of the *disconfirmation experience*. The disconfirmation is related to the person's initial perceptions (Walker, 1995) formed prior to the purchasing/consumption. When the supplier's performance is better than the *expectation* (which is not necessarily uniform across buyers) it yields a positive disconfirmation. Conversely, when the supplier's performance is poorer than the expectation, it yields a negative disconfirmation. Our research links this disconfirmation, which we refer to as 'performance gap', to the gap in the initial expectations, which we refer to as 'perception gap'.

Customer perceptions and expectations are undoubtedly central to supply relationship and supplier development. Studies by Oliver and DeSarbo (1988) and Andreassen (2000) found a theoretical support for the effects of perception on the customer satisfaction or dissatisfaction. They stated that the perception-based expectations cause an *assimilation effect*, while discrepancy between perception and reality results in a *contrast effect*. According to the *assimilation theory*, people tend to respond according to their

expectations because they are reluctant to admit wide discrepancies (Bridges, 1993; Lu and Betts, 2011). Perception and expectation also have a direct effect on the emotions of the parties participating in the supply chain relationship. People involved in the relationship experience pleasant or unpleasant emotional state depending on their expected levels of satisfaction (Vinagre and Neves, 2007). While framing the issues around perceptions and experiences, the above mentioned research studies appear to have fallen short of illustrating the linkage between the contrast in expectations (perception gaps), and the contrast in experiences (performance gaps).

From another angle, it can be observed that supply chain integration is becoming an increasingly critical factor in today's pursuit of business excellence (Kannan and Tan, 2010; Margetta, 1998; Lu et al., 2011). The magnitude of the perception gaps, or in other words the level of harmonised expectations in between the supply chain members, reflects how well the supply chain is integrated (Akkermans et al., 1999; Rosenzweig et al., 2003; Sun et al., 2009). On the other hand, a well-integrated supply chain can only be so verified if and only if it delivers the desired performance that satisfies the customer expectation (Gimenez and Ventura, 2003; Frohlich and Westbrook, 2001). The factors associated with perception gap, integration, and performance gap are part of the same system and are inextricably interwoven together. Thus, they must be treated together systematically. However, studies with such a system approach appear to be few and far in between.

The brief review above indicates that the research on how the perceptions of both customers and suppliers and their differences can affect the supply chain performance is clearly underexplored; and its relevance to the evolving theories on supply chain performance management is even more important. Thus, this paper aims at a better understanding that may lead to narrowing the gap through theoretical analysis and modelling between the perception gaps and performance gaps. The anticipated unique research contribution is to create an alternative and complementary approach, in both concept and practice, to address the critical issues of supply chain performance shortfalls.

3 Methodology and data collection

3.1 Choices of methodologies

To verify the three main perception gaps in the supply chain context (Figure 1), the *CFA* was chosen. Essentially the *CFA* is a type of *SEM* that deals specifically with measurement models (rather than structural models), which covers the relationships between observed measures or indicators from the surveyed data and the latent variables or factors from the conceptual modelling (Brown et al., 1998; Floyd and Widaman, 1995). A fundamental feature and the most common application of *CFA* is its hypothesis-driven nature (Cox et al., 2002; Thurstone, 1947), which fits precisely to the needs of this research.

For the exploration of the possible causal relationship between the perception gaps and supply chain performance, we used *SEM* (Spearman, 1904). Typically, *SEM* is an effective modelling tool, which could be very helpful in exploring causal relationship and structures of multiple factors (Bentler, 1988). The explicit distinction between factors and indicator in *SEM* allows one to test a wide range of hypotheses. Thus, in this research

SEM is used to test the hypotheses that *the perception gaps do have significant but negative impact on the supply chain performance.*

3.2 Survey and data collection

The survey was carried out to a sampled population of 232 individual respondents from 14 client companies as part of a global supply chain performance improvement project from June to November 2011. A key component of the project was examining the causal link between the perception difference and the collective supply chain performance.

The ‘collective supply chain performance’ here is defined as the measured performance delivered collectively by the members of the part of the supply chain. If the observation is made from a buyer’s perspective, then it is basically the supply chain performance delivered by all its suppliers collectively on the up-stream side. If the observation is made from the consumers’ perspective, then it simply means the whole supply chain’s performance delivered collectively by all the members of the supply chain. If the observation is made from a function within an organisation, it means the performance is collectively delivered by the up-stream suppliers plus the organisation itself and plus any relevant collaborators.

Every respondent was asked to complete an on-line questionnaire which consists of nine statements to be evaluated in a *Likert scale* of 1 to 9. The respondent population was a mixture of managers in different levels, such as team leaders, line-managers, and senior managers and so on. The questionnaire is shown in the *Appendix* where each statement (or question) constitutes a measurement instrument that delivers an observed measure. Although the data are collected from 14 different companies, the research makes no distinction between companies, simply because the hypotheses to be tested are not specific to any individual companies.

The data has then been screened to ensure that there are no significant missing data and the independent observable variables are normally distributed (normality tests) by using skewness and kurtosis test and Shapiro-Wilk test. The resultant characteristics of the nine observable variables are as given in Table 2.

Table 2 Results of the skewness and kurtosis and Shapiro-Wilk tests

		<i>LV1_a</i>	<i>LV1_b</i>	<i>LV1_c</i>	<i>LV2_a</i>	<i>LV2_b</i>	<i>LV3_a</i>	<i>LV3_b</i>	<i>PF_a</i>	<i>PF_b</i>
Skewness	Statistics	0.374	0.257	0.298	-0.212	-0.466	0.314	0.210	-0.501	0.337
	Std. error	0.363	0.235	0.302	0.321	0.487	0.299	0.233	0.493	0.389
	Z-value	1.03	1.09	0.98	-0.66	-0.95	1.05	0.90	-1.01	0.86
Kurtosis	Statistics	-0.112	0.265	0.611	-0.426	0.635	-0.534	0.245	-0.424	0.323
	Std. error	0.125	0.289	0.578	0.454	0.553	0.564	0.217	0.409	0.291
	Z-value	-0.89	0.92	1.06	-0.94	1.15	-0.95	1.13	-1.04	1.11

As shown in the table all the skewness and kurtosis z-value for the variables are within the span of -1.96 to 1.96 (Cramer, 1998; Cramer and Howitt, 2004). And the follow-up Shapiro-Wilk test shows all the $p > 0.05$ (Shapiro and Wilk, 1965; Razali and Wah, 2011). These test result show that our observed data are a little skewed and kurtotic for the nine independent variables, but they do not differ significantly from normality. The consistency reliability of the data, which measures the degree to which responses are consistent across the items within a measure, has been checked by using *Cronbach’s*

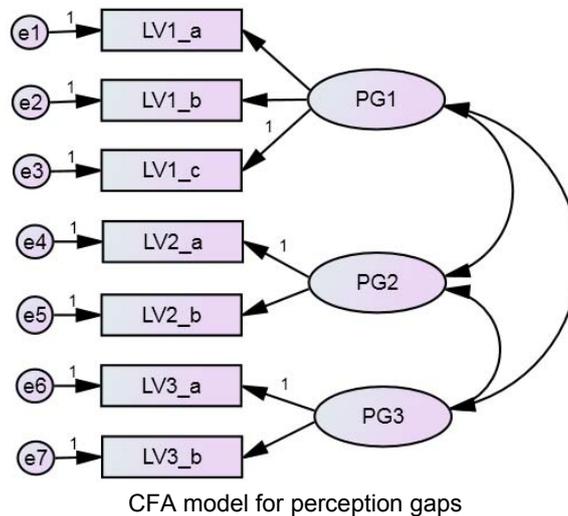
alpha. For the four constructs, the four Cronbach's alpha results are: 0.72; 0.81, 0.74, 0.77 (against the criteria of > 0.70).

4 Modelling, analysis and results

4.1 CFA analysis

With the already conceptualised *three-levels gaps model*, we first consider a first-order CFA model as shown in Figure 2. The purpose of the CFA is used to verify the structure of the measurement model. A precondition of CFA is the multivariate normality of the indicators' data. In the model, all the rectangles represent the indicators and ovals represent the latent factors, and the rounds for unique variables such as errors.

Figure 2 First-order CFA model for perception gaps (see online version for colours)



This model asserts that the three observed measures (indicators) LV1_a, LV1_b and LV1_c depend on an unobserved variable or latent factor PG1, which represents the Level-1 perception gap in the *three-levels gaps model*. And similarly:

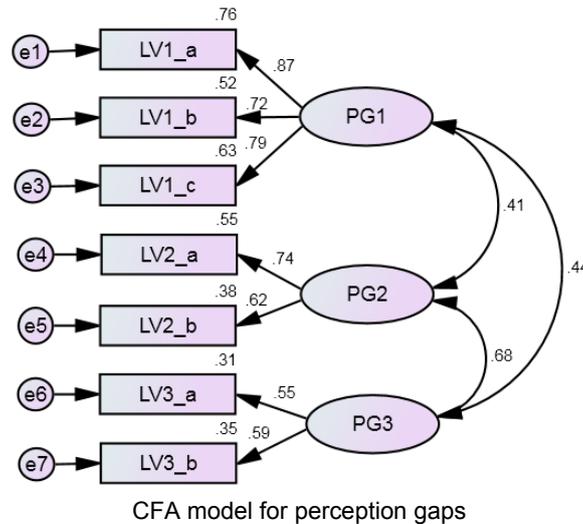
- the two observed measures LV2_a and LV2_b depend on the PG2
- the two observed measures LV3_a and LV3_b depend on the PG3.

It is worth noticing that the perception gap is not represented here by just one latent factor, but by three latent factors, each representing a perception gap at a specific level as described in Figure 1. This is entirely a model-design issue which is based on the authors' past research experience and overall understanding of this subject, but as a hypothesis in terms of this research. According to the model, every observation measure is determined by a relevant latent factor as an underlying variable that determines at least partially the outcomes of those observation measures. The model also postulates that the measures may also depend on something other than the latent factors. In the case of LV1_a, for example, the unique variable *e1* is also involved. *e1* represents any and all influences on

the LV1_a , which are not shown elsewhere in the path diagram. It also, very importantly, represents the measurement error that is likely to arise during the data gathering processes. The three latent variables are called the *common factors* because each of them is common to a number of observed indicators, whilst the seven ‘error’ variables are the *unique factors* since they only affect one observation test. The model also assumes that the unique factors are not significantly correlated with each other or with the latent factors.

The path diagram model in Figure 2 is created by using IBM SPSS Amos 20 software. The parameter estimation was based on the *maximum likelihood* (MI) procedure. The goodness-of-fit of the model was measured using goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and comparative fit index (CFI). The regression coefficients are calculated in *standardised* terms since the indicators are correlated, whilst the *unstandardised* regression coefficients (also easily calculable in AMOS) are often reserved for comparing the results for the same predictors across different samples, which is not the case here. Scales through *unit loading identification* are assigned to all the error variables and latent factors (‘1’ in Figure 2). After loading the data into the created AMOS model and running the analysis in AMOS, the first-order CFA is conducted. The results are shown in Figure 3 and the tabular summaries below.

Figure 3 CFA standardised results (see online version for colours)



The computation of the positive degree of freedom makes the model identifiable as the unit scaling has been assigned already. Number of distinct sample moments is 28, number of distinct parameters to be estimated is 17, and the degrees of freedom is $(28 - 17) = 11$.

Here the ‘sample moments’ means the number of known parameters, such as the total number of variance and covariance of the variables. The GFI = 0.953; CFI = 0.940; have exceeded the 0.90 level indicating a good model fit (Bentler and Bonett, 1980). However, the Tucker-Lewis index TLI = 0.93, which is just slightly below the threshold at > 0.95 (Hu and Bentler, 1999). The discrepancy degree of freedom ratio $\chi^2/df = 27.89/11 = 2.54$ is not much higher than 2.5 as it should be. The reliability of each indicator can be

analysed through its squared multiple correlation, suggested by AMOS. The values are shown on the top-right corner of each rectangle in Figure 3, indicating the amount of variances responsible by the underlying factors. The standardised regression weights (shown on each of the single-headed arrows) in Figure 3 show that the three perception gap latent variables do significantly determine the observed indicators. With the reasonably confident fit of the model and the significant impact demonstrated by the high regression weights, we may come to realise that the significant existence of the perception gaps has been verified.

The squared multiple correlations can be interpreted as the estimated reliability of each of the observed variables. To take LV1_a as an example, 76% of its variance is accounted for by PG1 – the Level-1 perception gap. The remaining 24% of its variance is accounted for by the unique factor *e1*. If *e1* represented measurement error only, we could say that the estimated reliability of LV1_a is 0.76. The resultant regression weights on the single directional paths show how much proportionally the latent factor affects the observed factor. For example, a regression rate of 0.65 means that a change in magnitude of 1 will result in 0.65 magnitude of change in the observed factor.

To summarise, the CFA analysis has positively tested with a high degree of confidence that the three factors of perception gap fit to the observed indicators well; the model-based ‘common factor’ hypotheses generally tested positive. We can state with confidence that there do exist the three latent factors that represent the perception gaps in the buyer-supplier dyad.

4.2 SEM analysis

The question of how does the perception gap impact upon the supply chain performance is better to be analysed through the SEM (Anderson and Gerbing, 1988). Based on the literature review discussed above and the authors’ priori knowledge in supply chain management, it is convincingly evident that the perception gap represents a negative factor to the supply chain performances. In other words, where there are more perception gaps between members of the supply chain on all types of performance delivery matters, there are poorer standards of performance. However, this argument can only be a hypothesis at this point unless it is tested otherwise. The structural part of our model is precisely designed for such a test and SEM appears to be the only suitable methodology in this context.

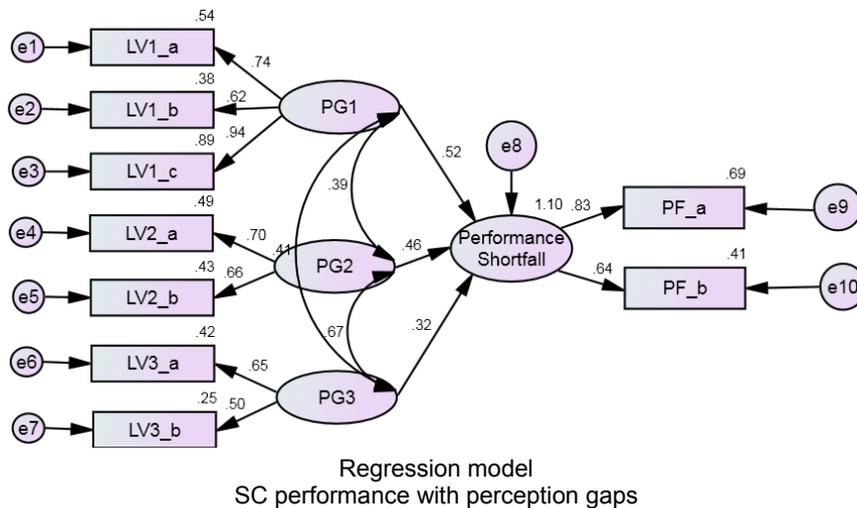
In the SEM model (Figure 4), the supply chain performance is conceptualised by the factor of ‘performance shortfall’ which can be measured from a number of perspectives, such as quality defects, delivery delays and non-compliance of technical specifications and so on. If any latent factors that represent the perception gaps have positive influence (shown through the factor loadings in the analysis below) on the *perception shortfall*, then this means that they have *negative effect* on the supply chain performance; and vice versa. The *performance shortfall* surely will also be affected by other systematic and unique factors that are not specified in the model. We use *e8* to represent them (see Figure 4). It is important to notice that in the key structure of the model the single-headed arrows are pointed from the perception gap factors and towards the performance shortfall, indicating that the ‘performance shortfall’ is the ‘formative second-order construct’ with the three ‘reflective first-order constructs’ representing the three perception gaps. In the meantime, the ‘performance shortfall’ is also a reflective measurement model on itself with two measurement indicators. It is clear that all the latent factors are built on a

reflective model with arrow-heads pointing from the indicators towards the factors. However the structural model, which represents the relations between the latent factors, is a second-order formative model. The SEM model constructed here is basically to test the significance or validity that the *performance shortfall* is causally associated with the perception gaps.

Statistically, as shown in Figure 4, what the SEM trying to achieve is a regression model of the performance shortfall with the unobserved factors of performance gaps at the three different levels. The coefficients of the regression indicate how much of the performance is negatively influenced by the perception gaps (a negative influence on the performance is interpreted as a positive influence on the performance shortfall). The answer to this question will surely reveal a better understanding of the causal factors to the supply chain performance.

Again, like CFA, we use IBM SPSS AMOS 20 software to analyse this relationship part of the model (Figure 4). SME is appropriate for complex multivariate data and testing hypotheses regarding relationships among observed and latent variables (Hoyle and Panter, 1995). In testing the formative constructs, as partly in our model, there are two general causal modelling approaches: the covariance-based methods or the variance-based method known as partial least square (PLS). Covariance-based methods are more appropriate for confirming theory and parameter estimation, and require large sample sizes and normally distributed data. PLS, in contrast, is more appropriate when theory is lacking but for prediction purposes (Chin, 1998). We applied the covariance-based method because our purpose is not theory generation but rather theory confirming, and we have a reasonably large sample size and normally distributed data.

Figure 4 SEM modelling for relationship between performance gaps and performance shortfall (see online version for colours)



The result of the SEM analysis shows an acceptable overall fit statistics: χ^2 of 55.28 and the degree of freedom $d.f. = 21$. The ratio of $\chi^2/d.f. = 2.63$, which is less than 2.5 as the recommended benchmark threshold. Number of distinct sample moments is 45, number of distinct parameters to be estimated is 24, and the degrees of freedom is $(45 - 24) = 21$.

The comparative fit index $CFI = 0.947$ (the benchmarking threshold is > 0.9); the root mean square error of approximation $RMEA = 0.088$ (benchmarking threshold is < 0.1); $SRMR = 0.078$ (the benchmarking threshold is < 0.08) Also particularly important for the structural part of the model, the significant ($p < 0.001$) and positive *formative* relationship has been demonstrated between the three *factors of perception gaps* and the market *performance shortfalls*. The standardised formative regression coefficients are estimated as 0.52, 0.46 and 0.32 respectively as shown in Figure 4. This, along with the fit statistics of the overall model provides support to our hypothesis that supply chain performance shortfall is a second-order construct composed of three perception gap factors, which negatively impacted on the performance. For a specific construct, whether should it be considered as a *formative* or *reflective* factor will depend primarily on the theoretical considerations. The most convincing test for the appropriateness of such theoretical consideration is the goodness of the model fit. The above analysis shows an adequate level of model fit.

5 Discussions of implications

The above analysis has led to a number of interesting theoretical issues that can be compared or debated with the existing body of knowledge.

The first issue is about the significant role that psychological theory played in influencing the supply chain performance or performance shortfalls as defined in the model. Established theories about supply chain performance are largely based on their relationships with multiple dimensional constructs such operational design, networking structure, technical and finance resources, strategic fitness/effectiveness, and market positioning and so on. None of them, however, have factored-in the psychological effects such as perception differences and what they may evoke as a result. The result of the above analysis has at least served as strong evidence that supply chain performance depends on how the psychological perimeter is managed. It further raises the further theoretical question on whether an organisation or a supply chain can be modelled as an organism that has psychological emotions that in turn determines its performances.

The second issue the above analysis provided is an underlying theoretical underpinning to the existing theory of supply chain integration. Why does integration positively contribute to the supply chain performance? The current body of knowledge emphasises that supply chain integration promotes sharing of knowledge and resource, stimulates synergy, coordinates flow of operations, synchronise the capacities and so on; thus integration contributes positively to the supply chain performance. The above modelling results show that all three levels perception gaps will engender negative influence on the supply chain performances, and plus that integration promotes better understanding, close engagement, and wider scale interfacing at the three-levels as discussed. Another important theoretical underpinning to the supply chain integration could be the closing of the perception gaps. In another words, supply chain integration do negate the effect of perceptions gaps and even prevent them from emergence. It can be further debated whether integration is actually also harmonising the 'emotions' of the 'supply chain organism' in order to improve its event-readiness.

How relevant is the issue of perception gaps in managerial practices? The above research analysis supports that it is critical to the supply chain performance. Its impact on customer satisfaction and overall supply chain achievement appears to be far more

important than we originally thought. We have now a lot more ground to argue that perception gap focused approach towards supply chain performance is a new way to understand and manage supply chain performance; not to replace but to complement existing theories and practices. However, it is conceivable that such renewed understanding may have the implications on the shift of focal area for supply chain performance improvement. Notwithstanding the importance of many existing performance improvement approaches and tools such as total quality initiatives, six sigma, agile supply chain, demand management, lean process, partnering and alliances, and etc., perception gap centred approach offers a fresh psychological behaviour dimension whereby one can address one of the root-causes of why performances are often fall short of customer expectation.

There may be direct strategy and policy implications for supply chain performance management too. Perception gaps and their identification must be taken into account when high-standard supply chain performance is to be achieved. The magnitude on narrowing or closing the perception gaps ought to be seen as a key performance indicator in supplier development. Cross-communication amongst the supply chain partners to establish systems for objective performance measurement should be used as a policy instrument to improve supply chain performance.

Cascaded from the points above, more widely associated managerial implications may also be explored. Although the data tested and analysed in this research were sourced from limited industrial sectors, the nature of the findings and their managerial implications appear to be generic and likely to transcend the specific domain. The logic of validity of this research follows a typical inductive research approach whereby general inferences are induced from particular instances, and a theory is developed from the observation of empirical reality. The following extended implications from the research all appear to be significantly and directly relevant to the practice of supply chain performance management.

- 1 Whilst there is a plethora of literatures talking about information sharing, collaboration and congruence in between the participating members of the supply chain, much less have been seen to be on the actual measures of their effectiveness in achieving them. Perception gaps and other related measures on the differences of expectations could serve as the key indicators to the effectiveness of information sharing and supply chain wide integration.
- 2 It can also be argued that the overall goal attainment of a supply chain is only logically possible if and only if when everyone in the supply chain have converged to a consistent understanding of the required performances and the harmonised expectations of the goals and targets. In other words, perception gaps as the major hindering factor in the SCM must be eradicated first or kept at minimum at a priority before even it is possible to address other improvement issues.
- 3 Perception gaps, as a result of different expectations on the performance targets and/or assumed capabilities arguably will create a raft of conflicting views on how the operational processes should be designed and managed. This will consequently engender some undesirable relationship issues, and over time lead to much lowered level of mutual trust in between the partners. Thus, instead of generally promoting the importance of relationship and trust in between the partners, managers now have more tangible measures to get started.

- 4 If the perception differences are about the suppliers' and buyer's business capacities in terms of product design, manufacturing capacity, quality and service, then there could be a serious consequence on the resource planning. In other words, the alignment and optimisation of the supply chain structural configuration can be seriously compromised by the presence of the perception gaps. A poorly optimised supply chain alignment will only deliver lower-than-standard performance. It may also affect resource allocation and cost-to-serve delivery. Perception gaps can therefore be the underlying hampering factor for developing deeper understanding of how supply chain should be integrated.

6 Conclusions

It can be concluded that the supply chain perception gaps have some significant causal relation to the performance shortfalls experienced in the supply chain management – a quite definitive answer to the first research question in section 1. The significance of causality may differ from one performance to another. However, this research demonstrates a substantive significance and a convincing level of correlation between the overall severity of perception gaps and the overall amalgamated supply chain performance with satisfying statistical confidences – a clear answer to the second research question. Both CFA and SEA analyses verified that the perception gaps are the latent factors that are independent, unique and non-captive in its role of influencing the supply chain performance. Thus the answer to the third question. This finding implies a new theoretical dimension whereby supply chain performance improvement could be better achieved in a more effective way. This dimension is the supply chain's psychological behavioural dimension where human perceptions, and the conflict of them, could evoke emotionally charged judgement and adversarial undertaking. So far, no theoretical attention in supply chain performance appears to have been drawn towards that dimension yet. Admittedly, working on the perception gaps dimension is only complementary not mutually exclusive to other established theories and practices.

There are also some limitations to the current research. The research data consists only of the organisations that we have prior relationship with and is not specifically coherent in terms of the type of business. It would be interesting to apply the similar research to a group of businesses in a specific business segment and specific channel positions to reveal more specific nature of the perception gap and their influences to the supply chain performance. Also, more sophisticated test and goodness of fit test could be applied in the model analysis to make the research more rigorous.

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Appendix*Survey questionnaire*

<i>Category</i>	<i>Label</i>	<i>Statement</i>	<i>Not true-----Very true</i>
Level-1 gap	LV1_a	What your suppliers' understanding on the detailed quality requirement from you is exactly what you understand that they ought to be?	1, 2, 3, 4, 5, 6, 7, 8, 9
	LV1_b	What you expected from your suppliers on the delivery service standard is exactly what your suppliers perceive and understood on what to be expected?	1, 2, 3, 4, 5, 6, 7, 8, 9
	LV1_c	What your suppliers' understanding on their own performance and capability to deliver long term performance is exactly the same as what you always perceive them to be?	1, 2, 3, 4, 5, 6, 7, 8, 9
Level-2 gap	LV2_a	For the same categories of goods and services, different suppliers appears to understand all your technical requirements precisely the same way and have exactly the same understanding on cost efficiency and pricing structure.	1, 2, 3, 4, 5, 6, 7, 8, 9
	LV2_b	The communication and collaboration within the same supply tier appears to show that there are no discrepancies in between them on the range of supply requirements from you.	1, 2, 3, 4, 5, 6, 7, 8, 9
Level-3 gap	LV3_a	It is evident to you as a buyer that everyone in the same supplier company appears to know precisely what their buyer expect from them and in precisely the same details.	1, 2, 3, 4, 5, 6, 7, 8, 9
	LV3_b	Any new development in the B2B market is most effectively communicated throughout the organisation to everyone, and difference in understanding of the supply requirements within the company never occurred.	1, 2, 3, 4, 5, 6, 7, 8, 9
SC performance shortfalls	PF_a	Your supply chain has been unable to deliver what the end-customer wants in terms of the value of goods and service, suffering largely from the lack of communication in the B2B market.	1, 2, 3, 4, 5, 6, 7, 8, 9
	PF_b	Your supply chain has been competing ineffectively in the market place, largely due the low standard of delivery efficiency and effectiveness in the B2B channel.	1, 2, 3, 4, 5, 6, 7, 8, 9