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## EXAMPLE MODELS OF BUILDING TRUST IN SUPPLY CHAINS OF METALURGICAL ENTERPRISES

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The article is an introduction to the notion of building trust in supply chains. Foreign publishers offer many articles connected with trust and some of the most important ones were quoted in this article. In business world there are models based on trust of the companies which are connected with one another and such models are very popular. Trust becomes the key link in the organisation of supply chains. It is one of the basic mechanisms of action co-ordination which provides the correctness of functioning in the whole chain. The growth of importance of trust between the links of the chain is also observed in metallurgy sector. For the purpose of this publication example models of supply chains structures were constructed in which relationships are based on mutual trust with characteristics of the metallurgical sector taken into account.

*Key words:* trust, supply chain, metallurgy sector

**Primjer modela izgradnje povjerenja u lancima opskrbe poduzeća u metalurgiji.** Članak je uvod u primjer izgradnje povjerenja u opskrbnim lancima. Inostrani nakladnici objavljuju mnoge članke povezane s povjerenjem, a neke od najvažnijih su citirani u ovom članku. U poslovnom svijetu postoje modeli temeljeni na povjerenju tvrtki koje su povezane jedna s drugom i takvi modeli su vrlo popularni. Povjerenje postaje ključna karika u organizaciji opskrbe. To je jedan od temeljnih mehanizama koordinacije koji osigurava ispravnost funkcioniranja unutar cijelog lanca. Rast važnosti povjerenja među tvrtkama unutar lanca opskrbe je također promatrana u sektoru metalurgije. Za potrebe ovog rada kreirani su primjeri modela lanaca opskrbe u kojima se odnosi temelje na međusobnom povjerenju kod čega su uzeta obilježja metalurškog sektora.

*Ključne riječi:* povjerenje, lanac opskrbe, metalurški sektor

### INTRODUCTION

Supply chains are of increasing importance along with the development of the world market. The supply chain (SC) is defined as a group of mining, manufacturing, trading and service companies as well as their customers between which streams of products, information and financial assets flow [1]. This is a sequence of various enterprises and commercial entities connected with one another by relationships and complex dependencies. A comparison of the supply chain and the flow of goods within its framework to a relay run is a very accurate one. The concept of the SC exceeds the framework of a single enterprise. It is a concept of inter-organization problem solving, logistical operation and management at the meta-solution level. Hence, the supply chain should be understood as a meta-structure [1].

SC is a structure which goes beyond the legal borders of the enterprises in which they function. In business globalisation the SCs become longer and the enterprises which cooperate with one another maintain contact

with the use of Internet and information and communication technologies. Virtual organisations more and more often become the participants of the SC.

New conditions (globalisation, virtualisation, branches of a chain, innovativeness etc.) made the problem of trust really popular. On the basis of theoretical solutions practical concepts of building trust in the structures of co-operating enterprises have been developed. The publication presents notion of building trust in SC on the basis of co-operating enterprises of metallurgy sector. Basic models of building trust are suggested here and the permanent links in particular sectors are underlined, which means the ones of the so-called core of SC and additional links (attaching links, also called satellites [1], for example the distribution companies and service centres).

### TRUST IN SUPPLY CHAINS

Trust is the feature of business relations. Trust is an expectancy of positive (or non-negative) outcomes that one can receive based on the expected action of another party in an interaction characterized by uncertainty [2], trust is inspiring, it increases productivity advantage [3], organizations in a high-trust environment were signifi-

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cantly more effective in problem solving [4]. The aggregated level of trust and control will determine a firm's confidence in partner cooperation [5]. Trust, it is argued, only becomes operational when the trusting parties are vulnerable [6], trust is an important aspect of a good relationship [7], the role of trust in cooperative relationships is of fundamental importance [8].

According to D. Białaszewski and M. Giallourakis trust is the conviction that the word or a promise given by a business partner is reliable and that a given entity is going to meet their obligations [9]. J.C. Anderson and J.A. Narus also refer to a conviction underlining that trust is connected with actions taken by co-operating enterprises, which in the final result bring benefits [10]. Trust means awaiting positive results of actions from business partners as a result of co-operation of enterprises in conditions of changeable and dynamic surrounding [11].

Co-operation of enterprises in the supply chain based on trust is connected with their exposure to business and market risk. Hyper-competition, business activities often beyond borders of time and space, the drive to innovativeness and other conditions impose immense requirements from the market side on the participants of the SC which can be met thanks to trust. Trust in SC is the correct prediction of the actions of the others which has influence on functioning of the whole SC [12]. It can be most generally assumed that trust in the SC is [1, 13]: (1) trusting particular links in the chain and assuming that they are credible (until it is proved to be the opposite), (2) treating the trust of others towards us seriously and meeting the expectations of others (until it is proved that the trust was not authentic).

In the supply chain trust is one of the key factors of co-operation. Examples of trust are [1, 14]: (1) trust that the supplier and the subcontractor perform their service in accordance with the specification, (2) trust that the supplier with which the enterprise has not cooperated before would deliver the product of the proper quality, (3) trust that the customer will settle the payment in the set time and will not cause late payments.

During the co-operation of enterprises various reactions of trust occur in the SC because the benefit of one side is dependent on the actions of other participants. Risk and uncertainty connected with trust and co-operation rise together with the rise of the number of links in the chain. The more links in the supply chain (number of the enterprises which form the SC) the more relaxed a meta-structure becomes. This relationship results from exclusion of relationships (contacts) of selected the links. Between particular enterprises there is no possibility or necessity to start business relationship (for example the subcontractor from the supply channel does not need to contact the distributor in the distribution channel). The constructed network becomes loose.

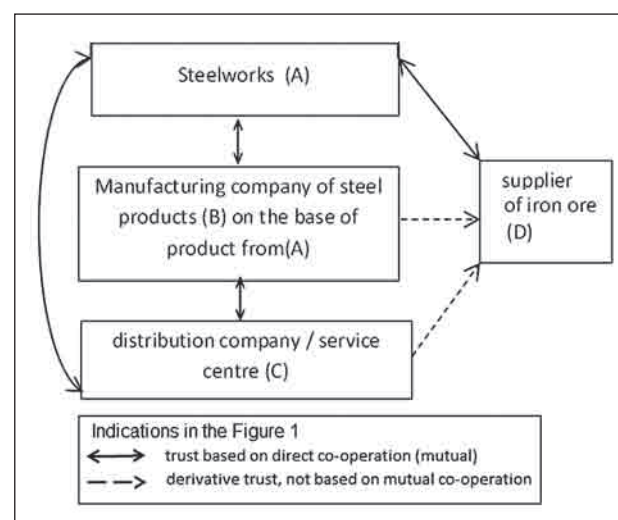
The level of trust and the level of cooperation of enterprises resulting from it in the SC may be increased by [14, 15]: (1) keeping long-term business contracts (trust

based on experience), (2) transfer of the right information in communication systems (trust based in the access to information), (3) increase of knowledge about particular participants of the supply chain and functioning of the whole chain (trust based on knowledge), (4) participation in costs of functioning of the whole supply chain and pointing out the benefits of remaining in a given business relationship (calculation trust), (5) application of the verification system based on the possibility of checking the actions taken by a partner, implementation of different punishments (verifiable trust), (6) commitment of all members of a chain in its permanent improvement by development in common product or service through common investments.

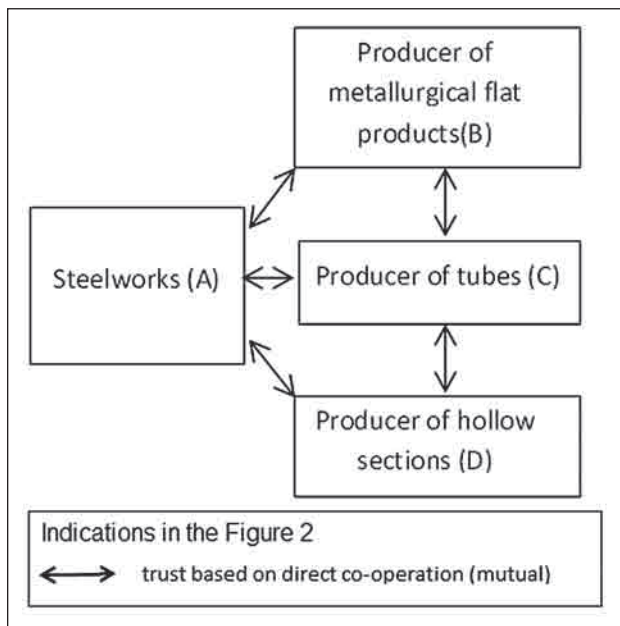
### CONFIGURATION OF TRUST IN A SUPPLY CHAIN

There are more structures connected with co-operated companies in business. A system of occurrence and transfer of trust can be constructed [1]. This publication presents theoretical systems where the links are the participants of the SC in metallurgy sector. First unambiguous situation is presented in Figure 1.

Manufacturing metallurgical enterprises **A**, **B**, where **A** is a metallurgical enterprise with full production cycle and **B** is an enterprise dealing with processing of metallurgical products cooperate with one another (semi-finished products from steelworks **A** are purchased by enterprise **B** and further processed). Another link in the chain is distribution company **C** (and/or service centre). The abovementioned enterprises co-operate with one another and trust enterprise **D**, which is a supplier of iron ore, basic raw material to produce steel (the chemical composition of iron ore mainly decides on the quality of the metallurgical products). In the analysed supply chain only steelworks **A** which conducts the full production cycle cooperates directly with the supplier of iron ore. The co-operation agreement between the pro-



**Figure 1** Cooperation and influence of trust between steelworks, supplier of iron ore and distribution company/service centre [16]



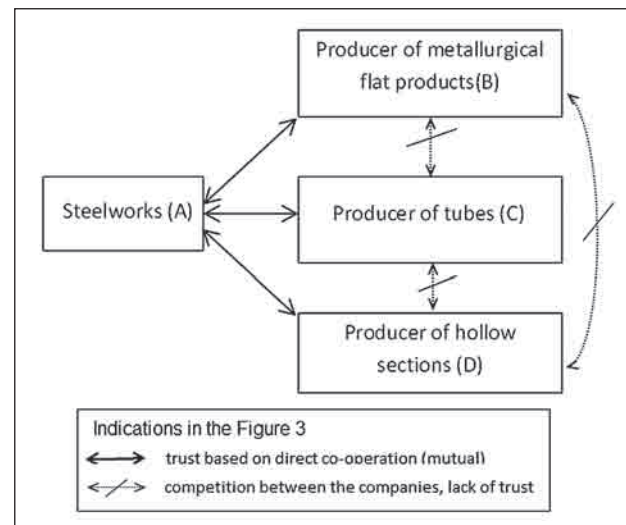
**Figure 2** Cooperation and influence of trust between steelworks and producers of particular products with derivative trust for distribution company

ducer of steel with the supplier of the iron ore is often a long-term agreement due to limited number of iron ore suppliers and limited accessibility of this raw material (big bidding power suppliers according to five forces model by M.E. Porter).

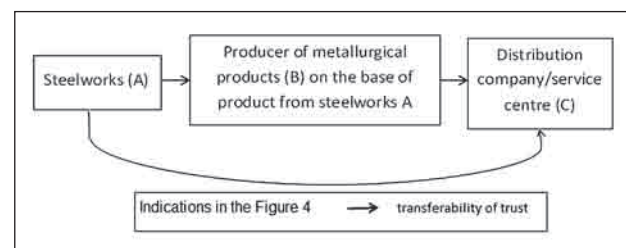
Between the producer of steel and the supplier there is a strong relationship based on trust. Such positive relationship influences also the relationship between **A**, **B** and **C** and **B** and **C** towards **D**. As a result of similarity in reactions an increase of credibility and trust occurs between those companies. Certain system of trust is created and such system is presented in Figure 1. The opposite situation is presented on another graph (Figure 2).

Here enterprise **A** co-operates on the same rules with a number of enterprises. Enterprise **A** in metallurgy sector may be a big manufacturing enterprise with full production cycle of steel. The enterprise co-operates with producers of particular metallurgical products which are created on the basis of semi-finished products delivered by the steelworks [17]. Such co-operation and trust of **A** towards particular producers of metallurgical products increases the trust between the other links in the chain: **B**, **C** and **D** in reference to additional links, for example distribution companies. Their commitment increase and their prestige become greater. Presented situation is inclusive because it integrates business partners [1].

The situation gets more complicated when the relationships between steelworks **A** and particular enterprises of metallurgical processing are not strong. Company **A** co-operates with enterprise **B** on one occasion and other time it co-operates with **C** or **D**. Between **B**, **C**, and **D** starts competition. Competitive character of such co-operation starts reactions of distrust between the rivals [1] and in case of presented model they are presented by crossed line of trust (Figure 3).



**Figure 3** Trust and Lack of trust between companies in metallurgical sector



**Figure 4** Bridge of trust between co-operate companies in metallurgical sector

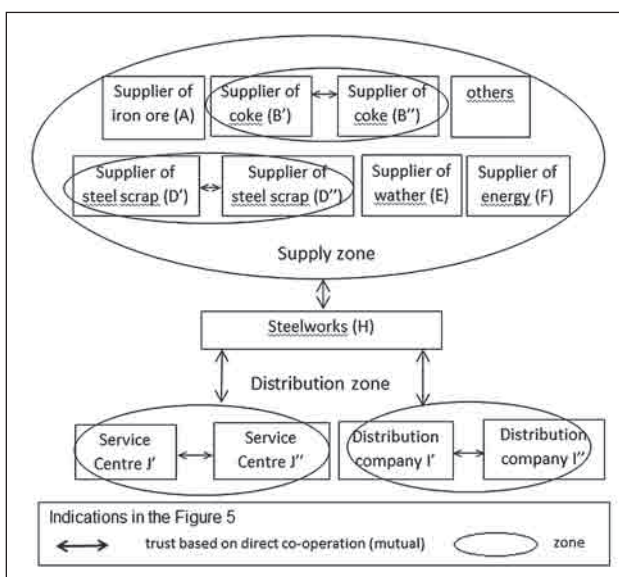
In SC of cooperating enterprises of metallurgy sector there are also bridges of trust. Bridge here is an enterprise which transfers relationships. Therefore, a transfer of trust occurs on the following link in the SC [1].

Company **A**, for example steelworks manufacturing steel, trusts company **B** which is an enterprise of metallurgical processing and company **C** which is a distribution company delivering products to the final recipient. Link **C** may also be a service centre which prepares a metallurgical product to match the order of particular customer [17]. Enterprise **B** while looking for a distribution company for their products uses the trust to **C** which was initially trusted by company **A**. On the basis of positive opinions and beneficial assessment of credibility enterprise **B** will also trust **C** and a mutual co-operation will start (Figure 4).

Presented co-operation systems present typical relationship chains which are trust systems for three or four links in supply chain. Together with the increase in number of participants of supply chain the trust configurations become, as it was mentioned earlier, more and more complex and at the same time more complicated. Trust systems created in such a way create multithreaded configurations. Such configurations are networks in relationships between various enterprises representing various kinds of business activities.

Trust systems may be concentrated around one big enterprise – a central organisation is enterprise **H**, for example, steelworks with full production cycles which have





**Figure 5** Expanded trust system of enterprises co-operating in the supply chain of metallurgy sector [17]

significant share in the market. It is also a link which joins two separate groups of enterprises (Figure 5) for example deliverers and distribution enterprises. Enterprise **H** is also a bridge, but between existing supply channel and distribution channel. Such system is concentrated around the “dominant” enterprise (**H**). Enterprise **H** is a producer which uses the offer (services) of various suppliers: **A**, **B**, **C**, **D**, **E**, **F**, **G** and distribution companies (**I**) as well as service centres (**J**). Co-operation conditions aid building relationships based on trust and co-operation.

## CONCLUSION

Presented trust systems have open, dynamic and changeable character. It often occurs that they get extended by new enterprises. As a result of relationship transfer new multi-lateral relationships are created [1]. It is also a result of search for new business partners. Presented configurations are therefore representation of elementary situations and mechanisms of creating trust connected with them. The knowledge of simple mechanism and schemes certainly makes understanding of relationships in supply chain easier.

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**Note:** The responsible translator for English language is D. Grachal, Katowice, Poland