

Supply Chain Delay in Payment: Review, Classification and Future Research Directions

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Abstract

This paper converge the discussion of payment delays in supply chain management literature by way of a systematic literature review of high ranked journals in operation management. Demand, Inventory, Cash Flow, Financial Decision, and supply chain coordination were identified as major issues in Supply chain Delay in payments. In our research, we noticed an increasing trend in publications for analytical research which limits the generalizing of the findings due to the different assumptions used in the modelling process. Most of these studies were conducted in the retail sector due to its coordinate organizational structure. We found that Delay in payment, as a coordination tool, can improve both the supplier's and retailer's profit as we proposed a conceptual model that resume the impact of Delay in payments in the issues discussed above. Future areas of research are identified like research under dynamic scenarios, including multi-echelon partners.

Keywords

Payment Delays, supply chain, systematic review

1. Introduction

It has been generally observed that the credit period has become a major concern for most of retailers, as it not only has direct influence on inventory and finance, but also on the demand of an item (Ebrahimi et al, 2017). In practice, vendors often provide buyers with forward financing. A number of studies dealing with inventory problems under delay in payments have been published over the years. (Teng, 2002 ; chen and Kang, 2009, Tsao, 2014)it is observed that payments are made to the supplier immediately after receiving the items. In practice, the supplier will offer the retailer a delay period in payment for the amount of purchase to increase the demand known as trade credit period (Yang, 2013). Offering such a credit period to the retailer will encourage the supplier's selling and reduce on-hand stock level. Simultaneously, without a primary payment the retailer can take the advantages of a credit period to reduce cost and increase profit. (Ming et al, 2012 ; Jana et al 2012) The customer does not have to pay any interest during the fixed period but if the payment gets delayed beyond the period, interest will be charged by the supplier(Kumar,2010). This arrangement comes out to be very advantageous to the customer as he may delay the payment till the end of the permissible delay period. (Maihimi et al,2016). During this credit period the retailer can start to accumulate revenues on the sales and earn interest on that revenue. Thus, the delay in the payment offered by the supplier is a kind of price discount since paying later indirectly reduces the cost of holding and it encourages the retailers to increase their order quantity (chan et al, 2010). Moreover, paying later indirectly reduces the cost of holding stock. Hence, trade credit

can play an important role in inventory model for both the suppliers as well as the retailers in integrated inventory model. (Annadurai, 2013) In the modern global competitive market, the buyer and vendor should be treated as strategic partners in the supply chain with a long-term cooperative relationship. (Chen and kang, 2007) In real business environments, delay in payment is one of the widely employed ways of coordinating different SC members (Hojati et al, 2017) Under a delay in payment contract between a supplier and a retailer, the retailer can benefit from the delays in payment of the purchased items as long as he/she makes the globally optimal decisions from the whole SC perspective. The period of delay in payment is a key factor which must be approved upon by both members (heidari, 2015)

The remainder of the paper is organized as follows : Section2 provides a literature review methodology and a description of the taxonomy used in the study. Section3 outlines the qualitative and quantitative analysis of the literature, employing the proposed taxonomy. Section 4 represents the managerial implications and challenges under supply chain management Section5 includes the closing remarks and discussion about major issues in Payment Delays section6 conclude by identifying gaps in the research and proposes future research directions.

2. Methodological approach

This study adopts a literature review methodology, which has been encouraged in order to advance theory in supply chain management research (Wilding and Wagner 2014). A systematic procedure for retrieving and selecting the reviewed articles has been applied, following Tranfield, Denyer, and Smart (2003) and Denyer and Tranfield (2009). To minimise bias and to improve the validity of findings, the three subsections below outline the approach adopted for sourcing, screening and analysing the articles. This includes the criteria involved in sourcing relevant literature and the search strings used, which enhances transparency and aids replication

2.1 Sourcing articles

The starting point for the review was to identify the operations management journals to be included in the study. In order to include a range of disciplines within operations management and to report only on research of a high quality, three and four star operations management journals were selected from the Association of Business Schools journal ranking guide from “operation research and management science field” and “operation and technology field” (www.the-abs.org.uk). Our search was however supplemented by high quality journals from the CNRS list to improve completeness. Although our sourcing limited the breadth of the search, it meant the searches were more easily replicable which helps mitigate any reliability concerns of this study. Furthermore, the approach taken in Macpherson and Holt (2007) and Thorpe et al. (2005) was to search online databases, which meant there existed a high possibility of overlapping “hits”. Searching by journals, as in this study, meant that overlapping did not exist which could inflate the number of “hits”. Hence for greater rigor in our search, multiple databases were used but given the relatively small number of “hits”, overlapping between the databases was easily managed.

The second step was to identify the search term(s) and to search the journals identified above. Consistent with the approaches of Thorpe et al. (2005) and Macpherson and Holt (2007), the titles, abstracts and key words were searched for the exact terms of “Delay in payment”, “payment delays” and “trade credit”. All papers were included within the search up to and included 2018. The search retrieved a total of 77 papers.

2.2. Screening

The retrieved articles were subjected to three stages of screening:

- First, following Thorpe et al. (2005) and Macpherson and Holt (2007), we checked the relevance of the articles based on their titles and keywords. We aimed to ensure that the focus of an article was on delay in payment in supply chain, e.g. in terms of definitions, strategies, theories or any other aspect. We also scrutinised the abstract and conclusions of each article and, where necessary, scanned the whole article to further assess suitability. Papers were then removed as their reference to delay in payment was unrelated to the core argument of the paper, for example (Zhao et al, 2011), paper discussed supply chain finance, for example Protopappa-Sieke and Siefert, 2011, were removed. Finally, papers discussing working capital were removed as delay in payment was used indirectly, for example (Hoffman and Kotzab, 2010). After this stage, we retained a total of 38 papers
- Second, To ensure that we did not miss relevant articles, we further cross-checked the references of the 38 papers and, using NVIVO software, we retrieved a further four relevant papers. This approach of supplementing the

set of papers that had been mechanically retrieved ensured the list of articles was complete, but the number of papers added (4) was not so great to suggest the original search process was inadequate. After this stage we constituted a database of 43 articles.

- Finally, this stage involved extracting and documenting information from each of the 43 sources. To minimise subjectivity, the authors met fortnightly to discuss and resolve inconsistencies. Extracted information included proposed issues of delay in payment, along with strategies for managing its impact, plus details of the research methods and theoretical lenses applied in prior work.

2.3. Classification and coding

2.3.1. Nature of study

In the proposed taxonomy the nature of the study is considered to depict the motives of the study. As we know delay in payment is an exponentially growing area of research, the exploration of literature with the nature of study perspective identifies the way by which the study contributes to the literature. It indicates whether the study is conducted to describe delay issues and propose solutions with due analysis or, as in some cases, if researchers prescribe solutions based on their experience and expertise. As the risk perceptions are multi-dimensional and elusive. It will be interesting to explore the nature of the study adopted in the extant literature.

The nature of the study of the papers is analysed using the Malhotra and Grover (1998) scheme by categorizing them as having a positive research approach or a normative research approach. Papers that attempt to describe, explain, investigate and predict the current delay in payment in supply chain issues and practices with various perspectives are considered as positive research. On the other hand, approaches that deal with the issues in a prescriptive manner where the author suggest(s) what an individual should do in a particular risk situation are termed normative. In normative research the author usually recommends the guiding framework and suggestions based on their experience and expertise in a particular field.

2.3.2. Research methods

The next important element in the research approach is the research method, which represents the researcher's choice to follow the route to address the research objectives. Initially we follow the Wacker (1998) scheme and categorize the studies as conceptual, analytical and empirical. But owing to the fact that delay in payment has largely been adopted by practitioners and researchers from the last decade onwards, we require more detailed classification schemes to explore the underpinnings of risk management. Moreover, numerous emerging techniques, methodologies and approaches are involved to address the complex and entwined payment issues, which require a systematic framework to unify them under a relevant and logical classification scheme.

Focusing on this crucial need for comprehensive classification, we have fine-grained the classification by categorizing the conceptual study as basic theory, theory enhancement and literature reviews/ taxonomy developments. Empirical studies are categorized based on the method of data collection and analysis such as case studies, survey based statistical design and combination of both. It is recognized that analytical approaches have been widely developed during the last decade and it is becoming difficult to discriminate and classify them as they have a number of derived and common elements. However, attempts are made in this study to classify the efforts of researchers adopting analytical methods. We found that researchers adopt various approaches to develop the analytical models to assess delays in payment and their impacts. We first consider the factor of the modelling of delays in payment and further classify this with two elements : model type and model settings. Various model mechanisms are available in the literature : in the delay on payment perspective we consider them as mathematical, simulation based and multi-agent based. The second critical element of the analytical approach is the problem setting, which depends upon the nature of the study and scope and domain of the research problem. We consider these as linear problems setting, integer problem setting, dynamic problem setting and stochastic problem setting. (Singhal et al, 2011)

2.3.3. Analysis of the literature

In the following sections, we will present and discuss the results of the review of past journal articles dealing with « delay in payment in supply chain ».

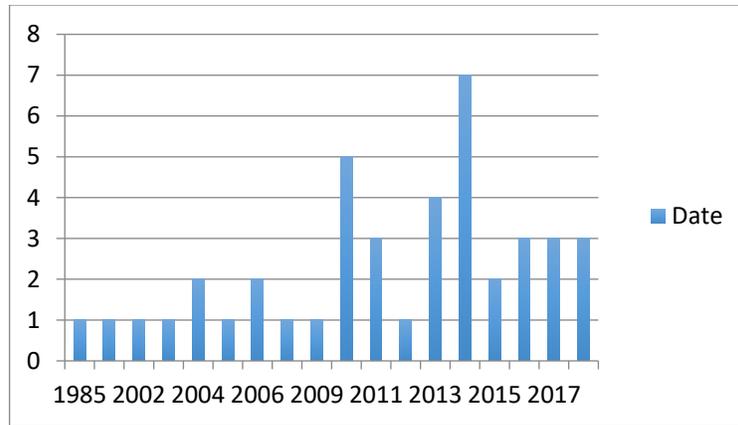


Figure 1 distribution of articles by date

Goyal (1985) was probably the first autor to develop a mathematical model for Economic order quantity for items for wich a supplier permits a fixed delay for settling the amount owed to him,probably due to the financialization of the economy (1980 to 2010) there was a long pause until the next articl was published in 2001 (Chang et al, 2001), maybe due to the bursting of the dot.com buble in 2000. Thereafter, momentum gradually built up and from 2001 onward, there was no empty publication space over that timeline except 2007, probably due to the fact that research on supply chain systems has focused on inventory cost, transportation cost and cost related to goods procurement in terms of information flow(Popa,2013) in contracst there has been very little research work that focuses on the flow of money (Hartley-Urquhart, 2006 ; Buzacott et Zhang, 2014; Blackman et al, 2015;Pfohl and Gomm, 2009; Wuttke, Blome and Henke, 2013). The sudden rise of publication in 2010 coincides with the financial crisis of the 2008, Ivashina et Scharfstein (2010) showed that the banking panic threw economie around the world in severe recession, banks where being restrictive and cautious after such a downturn, since suppliers equity levels were lowered during the crisis, Trad credit, trought, Delay in payment arises as an interesting subject for both academics and practioners.

2.3.3.1.Distribution of articles by Journals

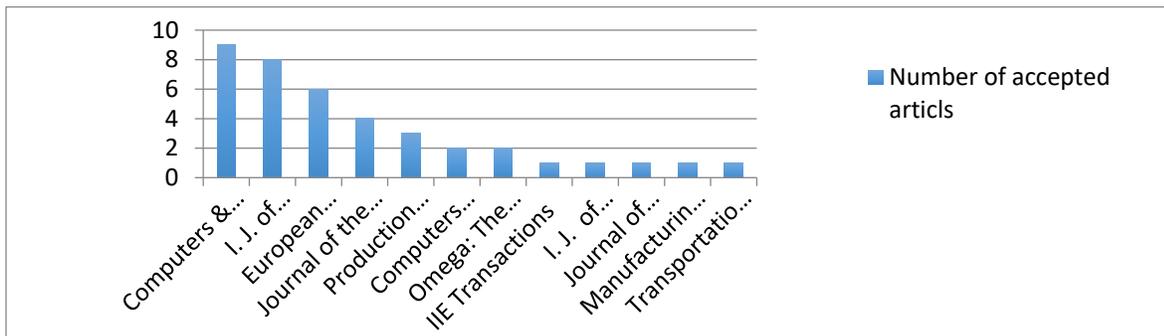


Figure 2 distribution of articles by journals

The studies based on payment delays have been published in a wide range of journals with both managerial and technical orientations. The selected research papers belong to 12 leading journals. Which clearly reflects the degree of diversity in Payment delays publications .There are very few top-tier management journals which have been attentive to Payments delays as a theme (36%), probably due to the fact that the very extensive supply chain literature addresses supply chain practices and performance (Swink et al., 2007; Flynn et al., 2010) and supply chain strategies and their dynamics over time (Ketchen & Giunipero, 2004), Financial processes such as invoices, payments, foreign exchange and banking transactions have received very little attention in the supply chain literature because previous research has tended to focus almost exclusively on the movement of products and services in the supply chain and largely ignores the movement of money and related financial activities. (Swink et al., 2007) Research on supply chain

management has focused on inventory cost, transportation cost and cost related to goods procurement in terms of information flow (popa, 2013)

2.3.3.2. Distribution of articles by research method, nature type and setting

We explore the literature and review the selected papers using the above discussed taxonomy. To develop a holistic view of delay in payments we included studies in practically all key demographical regions including Europe, Asia and America. combination of qualitative and quantitative approaches is adopted to describe the issues in the literature. The qualitative contents of the papers are provided in tables showing the imethodological approach used in the paper.

Autors Labels	Date	1985	2001	2002	2003	2004	2005	2006	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Normative		1	1	1	1	2	1	2	1	1	5	3	1	3	7	2	2	3	3	40
▼ Analytical		1	1	1	1	2	1	2	1	1	5	3	1	3	7	2	2	3	3	38
▼ mathematical		1		1																2
stochastic program setting				1																1
linear problem setting		1																		1
▼ mathematical						1				1	2	2	1	2	3	2		3	2	19
stochastic program setting													1	1	1			2	1	6
integer						1				1	2	2	1	1	2	1		1		12
linear problem setting																				1
▼ multi-agent			1					2	1		3	1		1	4			1	1	15
stochastic program setting													1							1
dynamic problem setting															1			1		2
Dynamic problem setting															1					1
integer			1					2	1		2				2					9
linear problem setting											1			1						2
▼ simulation						1													1	2
stochastic program setting						1													1	2
▼ conceptual					1		1													2
► theory enhancement					1		1													2
▼ positive														1				1		2
▼ conceptual														1						1
► literature review														1						1
▼ empirical																		1		1
► survey																		1		1
Total		1	1	1	1	2	1	2	1	1	5	3	1	4	7	2	3	3	3	42

Figure 3 distribution by research method, nature type and setting

3. Exploration of Delay in payment issues

There is very limited research addressing financial supply chain management, and substantial literature on supply chain management and cash management as an integrated area or as independent areas of research (Pfohl and Gomm, 2009; Wuttke, Blome and Henke, 2013). In line with the classification above and to relate the delay in payment with supply chain aspects researchers categorize it's orientation related to inventory management (1), cash management (2), Financial decision (3), and supply chain coordination (4) (Moussawi-Haidar et al. 2014), after classifying the articles the authors concluded that it including demand (5) to the categorization.

Issue	Autors	Nbr	%
Inventory	(chang et al 2001),(chang and wu, 2003), (huang, 2004) (taleizadeh et al, 2012)(gao et al, 2014) (Goyal,1985), (teng,2002)(Maddah et al 2004)(shi et al, 2018)(Priyan and Uthayakumar, 2014)(tsao et al,)(seifert et al 2016)(song and cai,2005)(chang et al 2010)(chan et al,2010) (chern, 2013)(zhang et al , 2014)(chung,2014)jaggi andkaussar(Zhao et al, 2017)(chen and kang, 2006)(seifert et al 2013)(zhou et al,2013)(abduljalbar et al , 2016)(jaber et osman, 2006)(Thangam and Uthayakumar, 2009) (Ho,2011)(Das et al,2013)(moussawi-haidar et al, 2014) (ouyang et al, 2015)(zahran et al,)(Tiwari et al, 2018)	31	33%
Cash Management	(zia and Taleizadeh, 2015)(chang and wu, 2003)(huang,2004)(Maddah et al 2004)(chang et al 2010)(chern, 2013)(ho et al, 2008)(chen and kang, 2010)(seifert et al 2013)(zhou et al, 2013)(abduljalbar et al , 2016) (moussawi-haidar et al, 2014)(chern et al, 2014)(zahran et al,)	14	15%

Financial Decision	(zia and Taleizadeh, 2015)(gao et al, 2014)(Goyal,1985)(Maddah et al 2004) (lashgari et al , 2017)(shi et al, 2018)(Jin et al 2018)(Priyan and Uthayakumar, 2014)(tsao et al,)(seifert et al 2016)(song and cai,2005)(chan et al,2010) (DU et al 2011)(chern, 2013)(zhang et al , 2014)(heydari et al 2017) (Zhao et al, 2017)(ho et al, 2008)(huang,2010)(chen and kang,2010) (lee and rhee, 2011)(seifert et al 2013)(zhou et al, 2013)(jaber et osman, 2006)(Thangam and Uthayakumar, 2009) (moussawi-haidar et al, 2014)(chern et al, 2014)(ouyang et al, 2015)(zahran et al,)(Tiwari et al, 2018)	30	32%
SC coordination	(chan et al,2010) (DU et al 2011)(zhang et al , 2014) (heydari et al 2017)(Zhao et al, 2017)(lee and rhee, 2011) (seifert et al 2013)(jaber et osman, 2006)(moussawi-haidar et al, 2014) (zahran et al)(Tiwari et al, 2018)	11	12%
Demand	(chang et al 2010)(chern, 2013)(jaggi and kaussar,)(chen and kang, 2006)(zhou et al, 2013)(Ho,2011)(zahran et al,)	8	9%

Figure 4 distribution of articles by major issues

3.1. Delay in payment and Inventory

Nowadays, it is a common practice in business to grant a delay in payment without paying any interest, as a result of increased order, if a supplier want to reduce his/her level of inventory, then he can offer a reasonable delay in payment for it's client without interest, specially for deteriorating item with short life cycle (for example agricultural product, see LI-juan et al,2012). This alliviation in the supplier's inventory have a positive impact on inventory total costs and thus positif impact on profit. From a retailer's perspective, benefiting of a payment delay, retailer order more than it's economic order quantity, larger inventory at disposition, increase the inventory but increase market responses to the client so delay in payment affect directly replenishment time interval and frequency.(see Chen and Kang, 2006)Delay in payement help optimizing the shipment lot-size thus reducing shippement cost per unit. (Priyan and Uthayakumar, 2014)

3.2. Delay in Payment and Cash management

Cash flow management is a critical element of many firms' operational strategies. Plenty of companies with paper prof its have failed because they lacked the cash to keep operating. A firm's cash flow can be manipulated in three ways: cash receivables from customer payments for delivered goods; cash invested in inventory holdings; and cash payments to suppliers for goods or services (Hoffman,2011). A company's cash position can affect its operations decisions and has been used more often in evaluating a company's financial situation. By definition delay in payment increaze retailers cash management and decrease supplier's one, for a sme wich have little acces to financing it can have a major impact on its continuity. A growing body of empirical literature suggests that cash constraints are the strongest reason for small business failures (see Hutchinson and Xavier, 2006).

3.3 Delay in payment and Financial decision

The financing decision is not only concerned with how best to finance new assets, but also concerned with the best overall mix of financing for the firm. A finance manager has to select such sources of funds which will make optimum capital structure. The important thing to be decided here is the proportion of various sources in the overall capital mix of the firm. The debt-equity ratio should be fixed in such a way that it helps in maximising the profitability of the concern. (See hoffman,2010) The raising of more debts will involve fixed interest liability and dependence upon outsiders. It may help in increasing the return on equity but will also enhance the risk. Many studies compare type Delay in payment impact the financing policy of both retailer's and suppliers as for size of Inventory location, logistical comodities and investment decisions.

3.4. Delay in payment and Sc coordination

Viewed by some researcher as an instrument of supply chain coordination (Du et al, 2011), Delay in payment succes

to integrate supply chains, and achieve a significant benefit for both the supplier and the retailer, by increasing profit (Chern et al, 2014) and decreasing supply chain costs (Moussawi-haidar et al, 2014). As the expected profit increase for both players, it ensures that they participate in the cooperation.

3.5. Delay in payment an Demand

Delay in Payment is often viewed by clients as a form of price discount (Zhang et al, 2014), it will improve sales and thus stimulate the demand for the clients and attract new buyers (Pourmohammad and Taleizadeh, 2015). As for its impact on cash flow it will drive clients for ordering more than they should.

4. Discussion

The study presents a systematic literature review on supply chain delay in payment related issues. We sorted and considered 42 papers published in 12 high ranked academic journals until 2018. The trend analysis depicted that there has been consistent growth in number of publications. As expected, publications distribution showed that Asia (84%) is the leading continent followed by America (11%). Our study reveals that, among different research methods, analytical modeling with quantitative analysis (numerical example and sensitivity analysis) is the most popular (90%) which could be attributed to highly customized nature of the subject first and the direct impact of numerical parameters such as profits and costs.

In this review, due to the large part of modeling, we classified the publication based on the modeling type and modeling setting then we classified the articles based on major issues distinguish current focuses and potential research avenues for researchers in the field of Delay in payments. The commonly cited issues are: inventory (33%), Cash management (15%), Financial decision (32%), Supply chain coordination (12%) and last but not least demand (8%). Interestingly, the issues are interrelated as the majority of our authors discussed more than one issue at a time, so we point out the fact that delay in payment issues can not be investigated separately,

To summarize our issues investigation, Delay in payment affects the demand which affects the inventory of both supplier and retailer and thus impacts their respective costs and profits.

Retailer's procurement cost linearly depends on the credit period and supplier's process cost also is a linear function of the amount of the quantity purchased by the retailer in a way to decide the position of the credit period and number of replenishment of the retailer in finite time horizon in such a way that the integrated system gets the optimum cost, the optimal selling price, the optimal length of production and inventory simultaneously such as the supply chain profit is maximized. In light of the study, we can assume that payment delays are a vital tool in today's business industry. The following Causal Loop Diagram summarizes the different impacts and interactions of Delay in payment in supply chain management, based on our literature review.

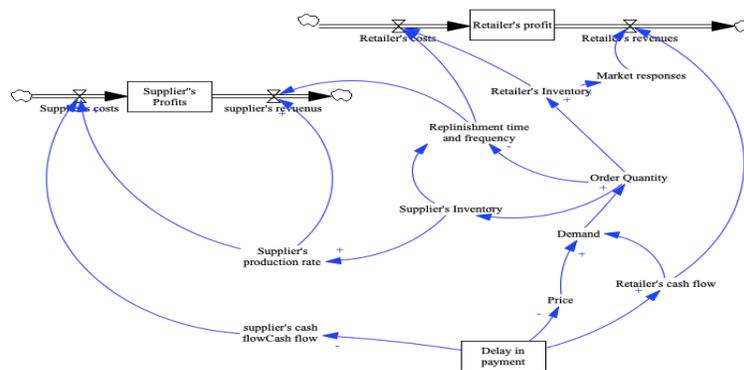


Figure 5 framework of payment delays in supply chain

5. Conclusion and Future work

This paper presents findings of a systematic review that managers can use to unlock the power of delay in payments along the cross-cutting themes identified in the study. The findings show that payment delays are a nowadays necessary tool to do business and supply chains should embrace it in order to build superior capabilities which can

become a decisive competitive advantage. Organizations need to leverage the information across supply chain to share the real time information, better understand customers, optimize supply chains and human resources, improve financial metrics and develop the critical insights for decision making. It is important to have an acceptable conceptual framework for capturing the business value in a systematic manner in this research stream. Therefore, future research can focus on developing explanatory and predictive models and theories that encompasses all cross functional facets for better understanding and growth of knowledge in this domain. Specifically, future research can explore multi-echelon dynamics environment to explore topics such as trust, social capital and contracts.

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