BUREAU OF BUSINESS AND ECONOMIC RESEARCH
SCHOOL OF BUSINESS AND ECONOMICS
UNIVERSITY OF MINNESOTA-DULUTH

Working Paper No. 89-7

BUYING JUST IN TIME: SOME PRACTICAL OUTCOMES FOR BUYERS

by

Paul A. Dion

Peter M. Banting

and

Loretta M. Hasey

February 1989

Buying Just In Time:

Some Practical Outcomes for Buyers

Paul A. Dion
University of Minnesota Duluth

Peter M. Banting
McMaster University

Loretta M. Hasey
University of Minnesota Duluth

February 1989

mgts\ms890216.pd

Buying Just In Time:

Some Practical Outcomes for Buyers

The 1970s saw manufacturing profit margins shrink as material and labor costs rose steadily while stiff competition from imports depressed selling prices. This cost and profit squeeze initiated determined efforts by US industrial management to cut costs. Input acquisition costs were a prime target of this effort given their large share of total costs. Inventory management in particular came under close scrutiny[1]. Just In Time (JIT) inventory management control offered a promising new approach to lowering costs. Indeed, it has been estimated by Abernathy, Harbour and Henn[2] that between one half and one third of the difference in landed US auto prices is attributable to the Japanese use of JIT inventory control systems.

This paper reviews the rationale behind the JIT concept and buyers' experience in using it. The results of case studies of 20 firms are reviewed. Some of the more important issues addressed in this study are:

i) Has the use of JIT been viewed as a success? In what ways has it been viewed as successful?

ii) Has the use of JIT altered the buyer's role or the buyer-seller relationship?

iii) Has the use of JIT enhanced the service received from suppliers? Specifically; has the number of backorders, defective goods and the lead time required for deliveries and the delivery frequency increased?

iv) Have buying firm outcomes such as purchase prices, materials handling costs, product quality and inventory levels improved through the use of JIT?

JIT: OPERATIONAL RATIONALE AND USER EXPERIENCE

How JIT Works

Before reviewing the past findings on JIT use it will be useful to discuss what JIT inventory control management is and the rationale behind its operation. The reader should not confuse the JIT and "Kanban" concepts. JIT is a logistics system which minimizes inventory by having it arrive at production and distribution points only when it is needed.[3] It can be used both within a firm and between firms in the distribution channel. "Kanban" refers to a manual system of cards, or other objects, which are used to initiate the production or delivery of inventory when it is required. Kanban is an information and control technique, often used in conjunction with JIT[4], which pulls work in process through a production process[5] in an individual firm.

Most markets are characterized by fluctuations in the level of product demand they exhibit. The traditional response was to schedule production and deliveries using one's best estimate of demand in the future and use buffer inventories to smooth discrepancies in the flows caused by faulty demand estimates or production facility failures such as machine breakdowns (Rosenberg et al. 1985). This is essentially the rationale behind both the reorder point (ROP) and materials requirement planning (MRP) approaches.

A JIT inventory control system delivers input to a production or distribution site only at the rate it is needed. Thus it reduces inventories whether it is used within the firm or as a mechanism regulating the flow of products between adjacent firms in the distribution channel. It is a "pull" system which replaces buffer inventories with channel member cooperation. There are a number of implications for the buyer purchasing JIT. Buyers need shorter lead times and often more frequent deliveries because of the lack of buffer inventories. Schonberger and Schneiderjans[6] discuss the tendency for some suppliers to relocate closer to major buyers in Japan. In order to cut work in process inventories and inspection costs the buyer requires high input quality and product complaints decline.[7] The buyer may share production forecasts and schedules with the supplier as well as including him in the design of products. Suppliers' salespersons spend less time selling and more time acting as a liaison between buyer engineering and their own production management.[3] The supplier in effect surrenders some of his production management autonomy to enter into a closer buyer-seller relationship not unlike the view of industrial market relationships described by Hakanson.[8]

What Has Been Buyers' Past Experience With JIT?

Celley et al.[7] offer the only other empirical investigation of JIT implementation which deals with more than a very small number of companies. Among the benefits of JIT implementation which accrued to the auto industry sample employed in the Celley study were reduced inventory levels, improved product quality and better customer, supplier and employee relationships. Unlike the present study they did not investigate the impact of JIT on prices, profits or the marketing/purchasing task itself. They reported that the biggest obstacles to successful implementation were customer scheduling and poor supplier product quality.

The other findings are based largely on case studies involving single firms. Cook[9] reports that Harley-Davidson's turnover went from 3 to 16. Sepehri[5] investigated the use of JIT in a US based Toyota truck bed plant. He reported large reductions in work in process and raw materials inventories, the need for raw materials handling equipment as well as improvements in employee morale and productivity. Schonberger[4] reports on the successful use of JIT, in conjunction with Kanban, in a number of Japanese companies.

In summary, most of the empirical research on JIT use is composed of case studies, excepting Celley et al. and it does not deal directly with such important variables as prices, profits and supplier product quality. This research is intended to fill that gap.

RESEARCH METHOD

The objective in using telephone interviews was to combine the strengths of the case approach (See 9, 10) with the reliability and generalizability of larger samples (See 7). Case studies allow in-depth analysis and the opportunity to communicate interactively with the respondent which is a distinct advantage when dealing with a complex question topic such as JIT. They fail however in that the usually small number of firms studied cannot be thought of as representative of the typical situation which practitioners experience.

Unlike other JIT studies which draw upon the experience of a single industry[7,11] this research questioned firms in the steel, home entertainment equipment, agricultural machinery, computer, home appliance and automotive industries.

The approach employed was to contact a firm thought to be using JIT (referrals from other users were one source of potential respondents) and identify the person(s) most responsible for materials management and JIT. This usually required a number of callbacks and short conversations with potential respondents. The next step was to establish that the respondent was actually using JIT as defined above. When a genuine user had been identified the interviewer worked through the 40 item interview protocol with the respondent. It was frequently necessary to make explanations and follow-up inquiries.

One drawback of using a single respondent within a firm is that he/she must supply information both inside and outside his/her primary area of expertise. For example, materials managers could be expected to be aware of JIT delivery characteristics but would have less precise information on product design changes resulting from JIT implementation. Another problem encountered in the study was the definitive attribution of buyer outcomes to JIT implementation alone when many other factors were probably involved. An additional difficulty encountered was that records on some aspects of JIT implementation were often not available. For this reason it was often necessary to record respondent agreement to a seven point agree-disagree scale rather than provide percentage figures.

On average the firms studied had been involved in JIT purchasing for 4.2 years, they produced between 60 and 70 percent of their products and bought 40 to 50 percent of their input on a JIT basis. Three quarters report producing technically sophisticated products.

RESEARCH FINDINGS

Buyer Outcomes: JIT Implementation Improves Purchase Prices, Product Quality, Inventory Handling Costs But Not Profits

Purchase Prices Approximately one half of the respondent companies perceived that the purchase prices of goods bought JIT were slightly lower while the other half observed no change. This finding is interesting given that supplying JIT, a higher service level, should be more expensive for the supplier. An interesting question is whether supplying JIT to buyers leads suppliers to achieve savings themselves through the adoption of JIT.

Quality of Products Produced Three quarters of the respondents reported that the quality of products produced with input supplied on a JIT basis was significantly higher than when they were produced using traditional methods. This finding supports those reported by Celley et al.[7] and is consistent with the philosophy of JIT. Successful JIT implementation requires higher supplier input and work in process quality because the lack of buffer inventories to replace defective products could lead to stockout situations. An interesting question to consider is why this increased product quality was apparently not rewarded by higher prices received by those supplying JIT.

Handling Costs Three quarters of the respondents viewed handling costs as unchanged with the implementation of JIT while the remainder saw a slight decrease. Although JIT implementation should lead to more frequent supplier deliveries and the associated increased handling costs for the buyer it appears that this was compensated for by the savings accruing from decreased inventories and their handling costs.

Profits Most respondents did not perceive the implementation of JIT as having led to increased company profits. This finding is inconsistent with the other reported benefits of JIT implementation such as decreased inventory levels. A definitive solution to this anomaly would require an audit of both the cost and revenue changes accruing from JIT use. Again the researcher would encounter the problem of establishing links between JIT operations and the financial variables. However, as described above, the respondents were operations managers. and if the profit impact of JIT had been substantial presumably these managers would be aware of this result. Again, the issue merits further investigation.

JIT Implementation Improves Services From Suppliers

According to the buyers questioned JIT implementation has led to significantly better supplier service. On the average backorders declined by 20 to 30 percent, lead times were cut by over 40 percent, damaged product occurrence declined by over 40 percent, 60 percent of the buyers reported significantly higher supplier product quality and supplier delivery frequency increased by over 200 percent. As a result, buyer complaints about products bought JIT were 20 to 30 lower than for non JIT products.

The results are understandable in terms of the overall JIT philosophy which is to replace

expensive buffer inventories with channel member cooperation. There results also confirm that JIT service to a buyer can also be described as simply a higher level of marketing service. This is especially true given the perceptions of buyers that the prices which they paid had not increased. Another implication from these findings is that the suppliers must have also benefitted from JIT in order to provide higher quality products and services at no price increase to buyers. The benefits of JIT thus appear to be bilateral; a fact which should be considered in negotiating JIT arrangements with suppliers.

JIT Has Changed the Buyer-Seller Relationship

In summary, the buyer became more closely linked with their suppliers. Over 80 percent of the buyers reported reducing the number of suppliers they dealt with and as a result 90 percent rewarded the remaining suppliers with an increased share of their purchase volume. In addition, 4 of 5 buyers made purchases from their suppliers in additional product areas. A consistent theme in the JIT literature has been the increased cooperation in the distribution channel characteristic of JIT. Indeed, over 80 percent of the buyer respondents reported that JIT led to the sharing of confidential information with suppliers.

The overall picture that emerges is of an augmented functional, and particularly, marketing relationship between buyers and their suppliers which is congruent with JIT philosophy. An interesting question is what further changes in these trade relationships will emerge as time passes. Perhaps we will see a further blurring of individual corporate boundaries.

Buyers Have Found JIT To Be A Success

In answer to a statement which read, "Overall, JIT has been a success at our company", all respondents recorded some level of agreement. On a seven point interval scale which read, "strongly agree", "agree", "slightly agree", "neither agree nor disagree", "slightly disagree", "disagree" and "strongly disagree" coded 1 through 7 respectively the mean response was 1.6 with a standard deviation of 0.7.

The respondents were also asked to freely describe why JIT was considered a success. The chief benefits in order of frequency of mention, were: improved product quality (for both input bought and products produced JIT by the buyer), decreased finished goods and materials inventories, decreased handling costs, the revelation of previously undetected materials inefficiencies, increased

supplier delivery frequency, more rapid response to their own customers and the decreased supplier lead times. The results are reflective of the JIT objectives described above but they can also be summarized in terms of superior logistics and marketing management. Industrial marketers should view JIT as a strategic competitive weapon rather than a condition of sale to be met.

Drawbacks To JIT Implementation

Although JIT was overwhelmingly viewed as a success by those implementing it there were some obstacles to its implementation. The most frequently mentioned was the coordination of the buyer's delivery requirements with the suppliers production schedules. One explanation for this problem might be that suppliers' commitments to other buyers might constrain their delivery options. A second problem was securing the necessary product quality from suppliers. Two additional problems were convincing supplier management of the benefits of the JIT program and coordinating information flows between the buyer and the seller. Supplier skepticism should be anticipated for a program which places many demands on them. Poor buyer-seller communications is less acceptable however because it is at the heart of the closer working relationship required.

Other Research Findings

Although the average respondent had been involved with JIT for 4.2 years 40 percent of them reported that implementation was still in progress. What this suggests is that the buyers took a gradualist approach and avoided the pitfalls of abrupt and extreme implementation which most experts caution against. Perhaps as a result of this two thirds of the respondents felt that JIT implementation did not cause a problem with the production of non JIT products. Only one half of the respondents reported that electronic data links with suppliers were initiated to accommodate JIT.

Because JIT requires shorter lead times and more frequent production changeovers for suppliers one might expect facilitative product design changes as a result of JIT implementation. However, only one half of the sample reported significant design changes attributable to JIT. The nature of the buyer-seller tradeoffs necessary to accomplish product design simplifications would in itself be a noteworthy research topic.

An added benefit of JIT implementation reported by four of five buyers was incremental sales to their existing customers. It would be hard to definitively link JIT with the increases; however there are a number of aspects of JIT which deserve consideration. One would be the increased buyer product

quality reported above and another would be the augmented responsiveness to customers reported by buyers which is certainly fundamental to marketing success.

SUMMARY AND CONCLUSIONS

In interpreting the results of this study it should be remembered that they are based on a small sample of companies. The findings should thus be viewed aa an initial inquiry which hopefully will be followed by others.

The objective in conducting the study was to address some of the issues in JIT implementation not covered by the present literature: supplier service performance, profit results, buyer purchase price levels and product quality. In general most of the positive results of JIT implementation reported by the buyer respondents were expected: higher product quality and augmented supplier service being the most important. An unexpected benefit reported by some buyers was lower prices for production inputs. Contrary to expectations JIT implementation was not accompanied by higher profit levels according to most respondents. However, as discussed above, methodological and interpretive problems precluded a definitive answer on this issue.

The philosophy of JIT requires that channel members substitute cooperation for inventories. The results reported here revealed closer links between buyers and their suppliers. Buyers reported sharing proprietary information with suppliers and received higher service levels in return. The increased effort by suppliers was rewarded by the buyers in terms of a smaller number of competitors for each product and an increased product volume for those suppliers retained.

A large proportion of those adopting JIT reported that even after an average of over four years experience with the program implementation was an ongoing process. A probable interpretation of this finding is that buyers first accepted the concept and then implemented incrementally as circumstances permitted.

In conclusion JIT should not be simply viewed as an operations tactic but also as a strategic competitive decision. The benefits of implementation reported by buyers, such as improved supplier product quality and service should give adopters of JIT a competitive advantage in their own markets. It is an old adage in marketing that one must buy well to sell well. Industrial marketers should note

that JIT implementation, because is has been successful in most cases, will spread. Suppliers must tailor their competitive efforts to a marketplace in which customers may be fewer in number and customer demands more stringent but individual trade relationships closer and more rewarding in return.

REFERENCES

1. Robert D. Polansky, "New Inventory Problems for Small Businesses," Massachusetts CPA Review, Spring 1984, pp. 20-33.

2. W. J. Abernathy, J. E. Harbour and Jay M. Henn, "A Report to the Department of Transportation," Transportation Systems Center, Cambridge Massachusetts, 1981.

3. L. Joseph Rosenberg and David P. Campbell, "Just-In-Time Inventory Control: A Subset of Channel Management," Journal of the Academy of Marketing Science, Vol. 13, No. 3, (Summer 1985), pp. 124-133.

4. Richard J. Schonberger, "Applications of Single-Card and Dual-Card Kanban," Interfaces, 13, (August 1983), pp.56-67.

5. Mehran Sepehri, "How Kanban System Is Used In An American Toyota Motor Facility," Industrial Engineering, (February 1985), pp. 50-56.

6. Richard J. Schonberger and Marc J. Schneiderjans, "Reinventing Inventory Control," Interfaces 14, (May-June 1984), pp. 76-83.

7. Albert F. Celley, William H. Clegg, Arthur W. Smith and Mark A. Vonderembse, "Implementation of JIT in the United States," Journal of Purchasing and Materials Management, (Winter 1986), pp. 9-15.

8. H. Hakanson, International Marketing and the Purchasing of Industrial Goods: An Interactionist Approach, (New York: Wiley and Sons), 1982.

9. James Cook, "Kanban American Style," Forbes, (Oct. 8, 1984), pp. 66-70.

10. Larry C. Giunipero and Edward F. Keiser, "JIT Purchasing in a Non-Manufacturing Environment: A Case Study," Journal of Purchasing and Materials Management, vol. 23, no. 4, (Winter 1987), pp.19-25.

11. Charles R. O'Neal, "The Buyer-Seller Linkage in a Just-in-Time Environment," Journal of Purchasing and Materials Management, (Spring 1987), pp. 7-13.