Information Filtering; A Service by Business Intermediaries

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1. Abstract

Business intermediaries are often blamed for not adding any value to the product. Therefore, it is always recommended to make direct business connections between producers and consumers. E-business made this connection more possible and realistic than ever in a large scale. The core assumption behind this value analysis is that the intermediaries' role is limited to the exchange of products and money. The present work recognizes the information flow through intermediary channels. This information, that is used in business for market analysis and forecast, advertisement and so on, like any other information is mixed always with noises, is produced in a format that may not be suitable for end-users, and reports facts with a delay that may be too short for decision makers to judge upon or too long to be useful at all. A sharp increase in demand in a very short time can be misleading for the producer to increase production capacities. The intermediary inventory can absorb this increase of demand if it does not survive for long; otherwise will pass it to the producer. Intermediaries, or any institution with similar effects, can filter the information to eliminate noises, to present it in a proper format, and to deliver it in critical time steps. This work may provide a new justification for the collapse of e-based enterprises after a rapid growth in late 1990s.

2. Introduction

The collapse of electronic companies (*.com*s) following the rapid boost of late 90s raised many questions about e-solutions adopted in business. This research is focusing on one of possible drawbacks of many solutions that are based on the direct purchase of goods from producers/distributors by consumers. The main idea is to identify the role of information filtering that is carried out by intermediaries in every business.

Intermediaries, such as distributors and retailers, are business agents that control customers-producers relations. Emphasizing on the fact that they add no value to the product, classical views suggest that eliminating them from the business chain can reduce the price of products and speed up the relationship between the customers and producers. Rapid development of information technology, easy access to the internet and to the statistics collected by internet questionnaires can further support the elimination the intermediaries. Therefore, producers have access to the information they need immediately using advanced IT facilities.

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Wigand and Benjamin [1] describe how the retail price in the high quality shirt market would be reduced by almost 62% if distributors and retailers were eliminated. Gellman [2], Gates [3] argue that as "friction-free" electronic marketplace lower the cost of market transaction, it will become easy to match directly buyers and sellers, and as a result, the role of intermediaries may be reduced, or even eliminated, leading to "disintermediation".

For Lewis [4], given that the internet encourages direct and immediate contact between suppliers and end users, together with a simultaneous drop in transaction costs, there is a strong case for internet-driven 'disintermediation'- or the elimination of the intermediary entirely [9].

Bakos [5] summarizes main functions of the market as to matching buyers and sellers, facilitating the exchange of information, goods, services and payments associated with market transactions, and providing an institutional infrastructure that enables the efficient functioning of the market. Internet-based electronic market place leverage information technology to match buyers and sellers with increased effectiveness and lower transaction costs, leading to more efficient 'friction-free' market.

Schmitz [6] identifies three services provided by intermediaries as to hold inventory to provide (the service of immediacy and) insurance against systematic valuation risks, to reduce asymmetric information by establishing a reputation, and to gather, organize and evaluate information that is dispersed in the society. It is shown that these three services are nor under threat by the diffusion of electronic commerce.

The emergence of cybermediaries as net-based intermediaries is noted by Sarkar et al. [7] and Bichler and Segev [8]. Cybermediaries are organizations that operate in electronic market to facilitate exchange between producers and consumers by meeting the needs of both producers and consumers. They also increase the efficiency of electronic markets in a role similar to intermediaries by aggregating transactions to create economies of scale and scope.

Vandermerwe [9] argue that 'electronic go-between service provider' goes one step further; it recognizes and uses the power and potential of advanced interactive technologies in order to link individuals who want products and services with those who can provide them. Then, in this new middle role, it integrates and delivers these offerings to customers as once superior experience. Cybermediaries, as Caillaud & Jullien [10] noted, specialize on the pure informational aspects of intermediation, the physical part being left to sellers' distribution system.

To summarize, if only transaction costs are considered both consumers and producers benefit from disintermediation. On contrary, if intermediaries play a role in the information flow by aggregating and disseminating data to customers, then, in an electronic market, this service can be provided by cybermediaries [11].

Based on a simple dynamics model, suggested by Forrester [12], to analyze distribution-production system, this paper investigates how intermediaries can filter the aggregated information and disseminate them to the third partner. It is suggested that even if intermediaries are replaced by cybermediaries in the e-market, the filtering role must be somehow be fulfilled.

When the supply chain is not properly managed even a small fluctuation in demand can cause large variations in the upper level of the supply chain. This is addressed to in the literature by the *bullwhip effect* [13]. In this paper it is also shown that the filtering role of intermediaries in the supply chain can reduce this effect.

3. Business Model

In the production-distribution model proposed in [12], distributors and retailers are intermediaries between producer and consumer. They have their own warehouses, processing delays, shipping etc. This model is very close to the real world even if delays can be reduced and backlogs can be decreased.

Following the eras of volume and quality, e-biz was now in the scene to provide a fast way to choose, to order, and to pay. For a short time, all statistics showed that consumers felt happier to choose in a wider range of products for better prices spending less time. Producers were also well satisfied of knowing what their consumers wanted. They could produce, just in time, what there was an order for. The money transfer was also much improved. It seemed that with only slight modification to the old models, the emerging version of the business would be understandable. All models had to be modified only for shorter time delays.

However, a major “why” raised after the recent collapse of dotcoms. Was it just a quick light in the dark or just the beginning of the end? This research is not to answer this big question. Rather it tries to illuminate some other aspects of a business that were never pointed out because they were always present. Aspects like the personal feeling about the merchandise or service, the person to person contacts involved in every business, and the information filtering. The concept of filtering signals comes from electro/mechanical systems in which low-pass or high-pass filters are sometimes important elements of a system. A low-pass filter, for example, pass only signals with low frequencies.

The production-distribution model of [12] is examined here assuming that delays are reduced considerably to make it closer to the e-biz world. For example, the delay in mail from distributor can be reduced from half a week to half a day or less and so other delays. Figure 1 shows the schematic of a system from producer to the customer including all delays involved. To adapt the model all delays are considerably decreased to examine the effects of deploying an internet-based business model on the production.

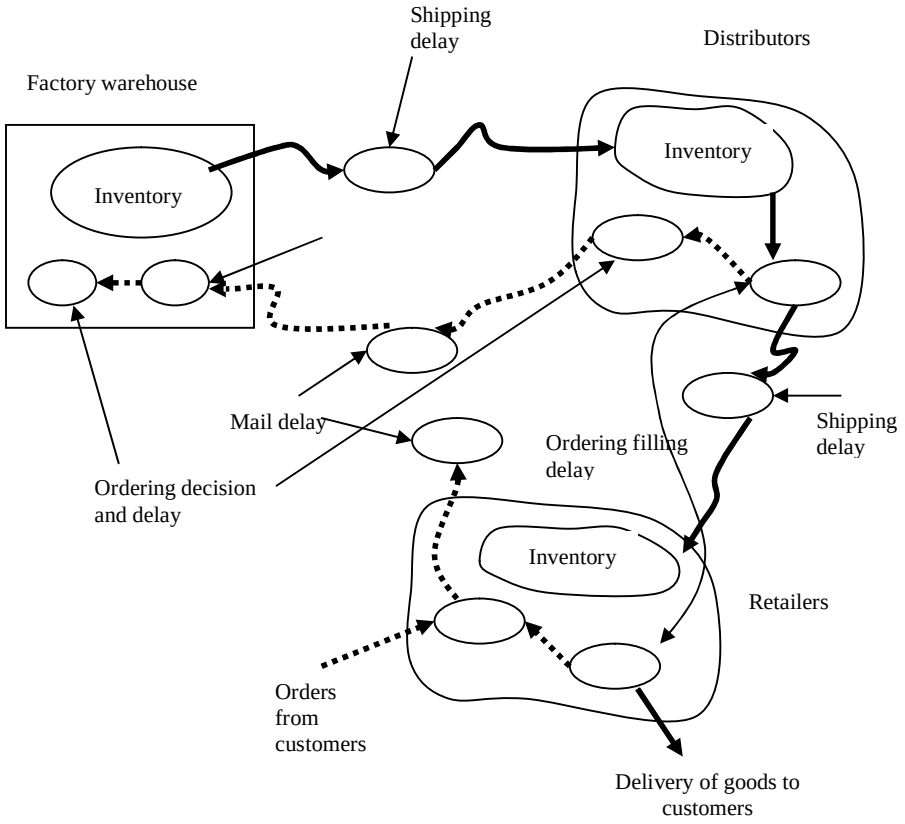

Figure 1: Schematic model

4. Filtered Information

The role of filtering was present in the main model when the fluctuations in demand were absorbed by the warehouse of the distributor, or intermediaries. The role of intermediaries, therefore, is not just transfer of goods and money between the producers and consumers. Since there is always a level in the intermediary section to accumulate the orders of the costumers, this level can also play the role of information filtering by just reflecting only the long-term changes in demand. To model this filtering, delay function of the intermediary level is replaced, in the modified model, by an averaging operator. Obviously, any averaging operator is playing the role of a low-pass filter since the output is insensitive to the fluctuations over small periods of the input. This element can well play the role of a filter that only passes the long-term changes of demand and is insensitive to short term periodic or random signals with high frequencies.

To examine the model, let us first consider the case when there is a medium-term sinusoidal change in demand. Figure 2 shows the factory production output of the normal business model for which delays are reduced to match the e-business solutions, Table 1. In figure 3 this model is examined when delays are accordingly changed to model the elimination of the intermediary or distribution section. As

shown in this figure, the bullwhip effect is reduced and the maximum amplitude of the factory output is decreased from 1680 to 1310 units.

Table1 Delays in the original model and modified model.

Delays	Original model (weeks)	Modified model (days)
Handling time at Distributor	1	0.001
Due to Unfilled orders at Distributor	0.6	0.001
Inventory (and pipeline) adjustment at Distributor	4	5000
Clerical at Distributor	2	0.00
Mailing from Distributor	0.5	0.00
Transportation to Distributor	2	0.00

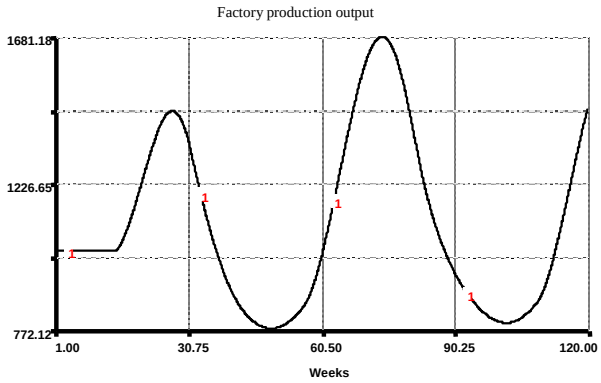

Figure 2 Original model with sinusoidal changes in demand;
Input = (100*sin (2*pi*time/52))

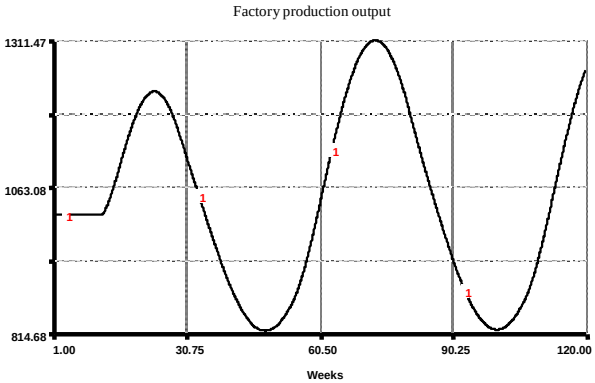

Figure 3 Delays in distribution section are almost zero.

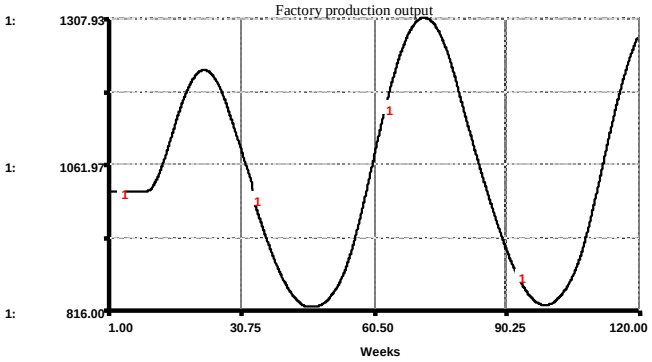

Figure 4 Delays in the distribution section are very short or zero, but the distributor filters the information of demand change with PSR[1] = SMTH[2]1(PDR[3],4), PSD[4] = SMTH1 (PDD[5],4).

Now let us our distributor plays his role of filtering still with very short delays to enjoy the benefits of electronic business. As shown in figure 4 the overshoot has not changed considerably than the previous case. This is because the sinusoidal change happened in a very low frequency over one year. To observe the effect of filtering, the input can be replaced by (100*sin(2*pi*time)). Then the out is as shown in figure 5, before filtering, and as in figure 6 after filtering. It can be seen that the domain of variation of factory output is very narrow (curve 1 in figure 5) and a simple smoothing can even make its band narrower (curve 2). However, with filtering, as explained earlier, the output converges to the gain of the input that is 1000 and the factory is ordered to produce enough to respond the average variation of the demand. It is notable however here that the overshoot is not changing considerably as expected.

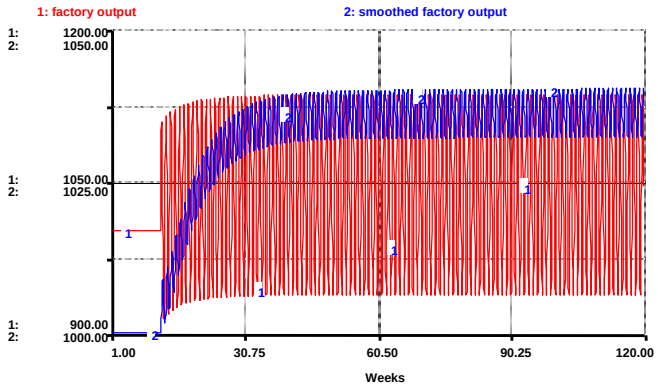

Figure 5 High frequent sinusoidal changes of demand cause variation of the factory output. Delays in the distribution section are zero and the input function is (100*sin(2*pi*time)).

[1] . Purchase order Sent from Retail
[2] . Smooth function
[3] . Purchasing rate Decision at Retail
[4] . Purchase orders sent from Distributor
[5] . Purchasing rate Decision at Distributor

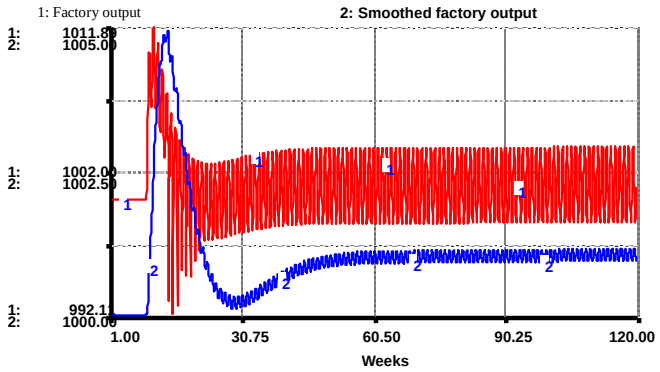

Figure 6 Filtered information of the demand change prevents rapid fluctuations of the output.

The effects of filtering on the output in response to random input are shown in figures 7-9. Similarly the model can be examined for other inputs such as step or impulse. It can be seen that the filtered information in the model with zero delays produce a similar overshoot at the beginning but in later times filtering produce a more evenly output.

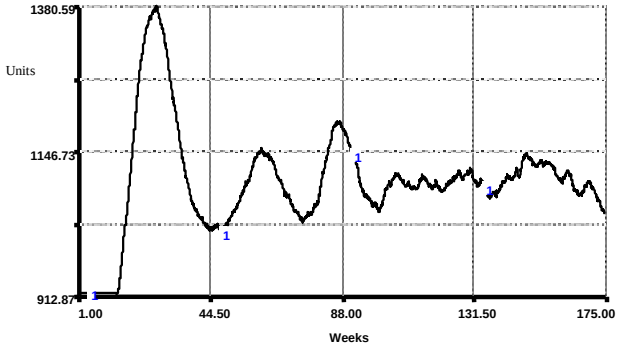

Figure 7 Factory production output; smoothed.
Original model with random changes of demand; the random function is: (normal (0,100,175)).

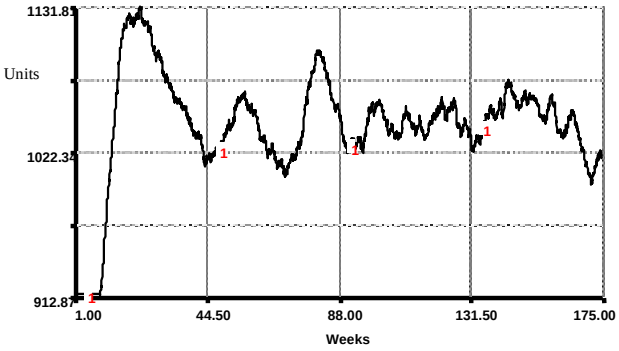

Figure 8 Factory production output; smoothed.
Delays in the distribution section are zero.

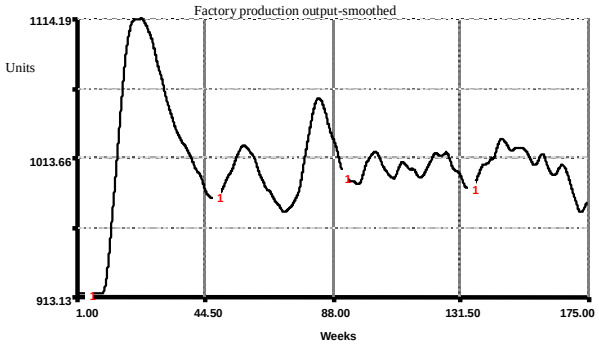

Figure 9 Zero delays with filtered information produce a similar overshoot but in the long-term more smoothed variations in the output.

5. Conclusions

The main aim of this paper is to appreciate one of the important services of the business intermediaries. It suggests that intermediaries can play more important roles than exchange of goods and money. They establish and control information channels between parties involved in a business. Information is not restricted to the demand variations; it can be extended to the variation in tastes of customers, information about competitors and so on. Filtered information can add value to the product by preventing rushed decisions to invest, or to supply. It can eliminate noises that are not inherent to the market trend. It can also increase the trust of the consumers by delivering to them the information that will not be proven to be hasty or misleading. Filtration can be applied to all information that is exchanged in the value chain. Thus, even in an electronic based business model in which there is no justification to consider delays introduced by the intermediaries, there is still enough room for cybermediaries to play the role of information exchange in the filtered form.

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