

## THE THEORY OF THE LEMON MARKETS IN RESEARCH

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### **Abstract :-**

The “lemon” problem was initially posed by Nobel Prize winner Akerlof in his seminal article of 1970 and showed how a market with unbalanced information, called information asymmetry, can lead to complete disappearance or to offerings with poor quality where bad products (lemons) wipe out the good ones. Empirical evidence for Akerlof “s theory came originally from the market of used cars, where the lemon is a well known problem. However the theoretical model of the “lemon” problem has proven also to be valid on other markets and in comparable situations like internal markets. The theory is also been used more and more in IS research especially since the emerging e-commerce initiatives and the continuous growth of e-markets and auctions. In this chapter we bring a description of the theory by presenting its nomological network and its linkages to other well known theories in is research.

**Key Words:-** Lemon Market, Information asymmetry, Adverse Selection, Moral Hazard, Trust.

### **INTRODUCTION**

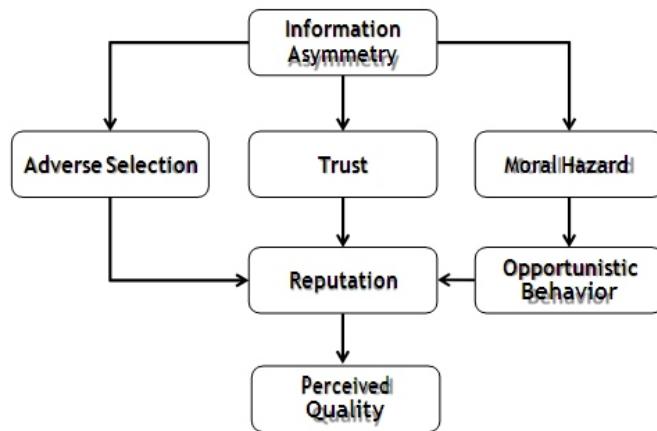
The market for “Lemons” is a popular expression for a wide spread economic theory developed by Akerlof in his seminal paper of 1970 (Akerlof 1970). According this theory there can be incentive for sellers to market poor quality resulting in a reduction of the average quality and leading to a death spiral with eventually a complete market deterioration. The phenomenon of a “lemon” market arises on markets where there is information asymmetry between buyer and seller and where the overall quality of goods and services offered is reflected to the entire group of sellers rather than on individual sellers. Lack of seller differentiation could force high-quality sellers to flee the market because their quality and reputation cannot be rewarded. Akerlof demonstrated his theory with examples from the used car market. Most of the empirical data for bringing evidence to the theory is coming from a used car market (Bond 1982). However the Lemon Market theory (LMT) is applied in a wide variety of similar market situations like electronic markets, wholesales automotive, and durable goods markets. LMT is predominantly applied in disciplines like economics, management, finance, and law. Although the LMT is well defined, its use in IS research is often vague and limited to a sole citation of the seminal article of the Nobel Prize winner Akerlof. Investigated phenomenon “s in today “s digital world by which the LMT is empirical tested are rather scarce. The strong ideas and explaining mechanisms in the theory are mostly taken for granted. Although the LMT is a grant theory with a lot of explanatory and generalizing power, its falsification and validity should be tested in every different empirical situation. However we can observe that the use of the LMT with empirical evidence in IS research is growing. The theory has surely gained attention in the strand of research on e-commerce with research topics like e-markets and auctions (Dewan and Hsu 2004, Pavlou and Gefen 2004, Lee et al 2010)

### **DISSECTION OF THE THEORY: ITS NOMOLOGICAL NETWORK AND CONSTRUCTS**

The nomological network is a concept developed by Lee Cronbach and Paul Meehl in 1955 and is a

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graphical representation of a theory by means of his constructs and their causality relations (Cronbach and Meehl 1955). It is in essence a way of showing construct validity for the measures that are used to validate the theory. The nomological network includes the theoretical framework with the constructs, an empirical framework showing how the constructs can be measured, and specification of the linkages between these two frameworks. In this work we only focus on the theoretical framework. Figure 1 shows our nomological theoretical network of the LMT.



**Figure 1. The nomological network for the Lemon Market theory**

The level of analysis for the LMT is a market (external or internal) where two transacting parties meet. The parties can be firms or individuals. The basic independent construct for the LMT is information asymmetry. Information asymmetry is a condition which is well understood and a very frequent occurring phenomenon in all sorts of human and organizational interactions (Stiglitz 2000). Since a situation of asymmetric information can emerge in several ways it is also well researched in a broad variety of situations. For example: insurance markets, management (shareholders versus management) (Chiang and Venkatesh 1988), organizational activities (Aboody and Lev 2000), professional expertises (doctor-patient, lawyer-client) (Nayyar 1990) are different sources of information asymmetry.

Information asymmetry engender strategic possibilities that can easily be modelled. The most generic way to do so is by applying game theory. This leads to capturing the richness of observations of real world phenomenon "s. However there are some drawback by doing so. Milgrom and Roberts (1987) point at two serious questions on the modelling of information asymmetry environments. First is the assumption that equilibrium behaviour will prevail and secondly the bounded rationality of the participating parties. This leads to models with less predicting power than explanatory power.

We consider here two groups of transacting parties: buyers and sellers. The buyer is the less informed party and the seller is the most informed party. The transaction is considered to take place on a internal or external market. On a market a buyer interacts with a seller, and a contract or transaction is negotiated. Christozov et al. see information asymmetry as a natural property of any communication process between a sender and a receiver, when both actors have different background and expertise, use different "jargon" or possess different information regarding the content of the communication session (Christozov et al. 2009). When there is information asymmetry, the distribution of information between the transacting parties is unbalanced resulting in an imperfect market. Some authors refer to a situation of information asymmetry as a situation of imperfect information. This asymmetry can put one party at an advantage while placing the other at a disadvantage and makes the decision of a product risky for a prospective buyer (Afzal et al. 2009). Information asymmetry depends on the different capabilities and intellectual levels of the transacting actors and is therefore considered as an independent construct for the LMT. Dependent constructs from information asymmetry are trust, adverse selection, and moral hazard. We discuss the three dependent constructs and their dependent constructs. The concept of trust is subtle, diffuse and elusive. Although there is agreement on the importance of trust there also appears disagreement on a suitable definition of the construct (Bigley and Pearce 1998). Trust is a dependent construct and can be seen as a co-ordinating mechanism based on shared moral values and norm supporting collective co-operation and collaboration within uncertain environments (Reed 2001). Trust is the degree to which one party has confidence in another within the context of a given prospect, decision or collaborative project. Blois gives a number of definitions of trust appearing in frequently quoted papers (Blois 1999). Trust/control relations between organizations can be seen as highly com-

plex structures of social relations and processes which are needed for the generation and maintenance of collective action. The concept of trust is crucial in business interactions that are characterized by mutual dependency combined by with a lack of mutual control. Some researchers argue that trust is also reciprocal. According to Reed: „ the essential character of all trust relations is their reciprocal nature. Trust tends to evoke trust, distrust to evoke distrust.... As trust shrinks, distrust takes over. The notion of trust is latent present in the seminal article of Akerlof as dishonesty. Information asymmetry may result in a misunderstanding or even erode existing trust between the participating actors. Trust is related to reputation. The concept of reputation is commonly used in social life and economy. Wilson defines reputation as: "a characteristic or attribute ascribed to one person (or organization) by another person (or organization)" (Wilson 1985). Reputation theory indicate that uncertainty about the seller "s honesty will affect the buyers " behavior (Kreps and Wilson 1982). Reputation can be formed by means of ratings by different buyers and can be seen as a measure that brings evidence a posteriori about the missed information or the hidden information and quality of the seller. When there is no proper reputation signaling mechanism on a market, there is incentive for a lemon market where it is preferable to offer low quality products and services (lemons) or no participation in the market at all in case of high quality sellers. In both cases the overall perceived quality is going down. According to Yamagishi and Matsuda (2002) reputation can provide an effective solution to the lemons problem when

- 1) it is shared by all or most traders in the market,
- 2) traders in fact base their behavior on it, and
- 3) the market is closed such that the trader who is excluded from it cannot find an alternative market.

The adverse selection is the second dependent construct of information asymmetry and is the process of selecting the wrong seller and consequently the least product quality. Adverse selection is a pre-contractual condition. Hidden information is sometimes used as a more practical term for the adverse selection. From the buyers point of view there is lack of knowledge on the features of the product or service and the real capabilities of the seller which may result in a wrong decision to select and leading to failure. From the seller "s point of view a wrong selection may result in the buyer "s dissatisfaction and eroding the reputation and consequently a drop of perceived quality. Moral hazard as the third dependent construct is a post-contractual condition and can arise from the seller "s fraud or incapacity to deliver the real quality of the offering. Hidden action or hidden intention are sometimes used as more practical terms for moral hazard, although we see these terms more as metrics for opportunistic behavior which can arise from moral hazard. We take the moral hazard construct into account because even if the problem of adverse selection is overcome by selecting a good seller with fair quality offerings, post contractually the seller may start to shrink on quality. This can be the case on markets where service offering are traded. For IS moral hazard happens when a the seller can gamble on a so called vendor lock, in which the buyer is confronted with high switching costs and forced to use the services of the existing IS vendor. Opportunistic behavior can erode reputation and leading to a drop of perceived quality. A lemon market must be seen as a dynamic process involving positive and negative feedback coming from closed transactions. Like a cybernetic system negative feedback can stop a market becoming a lemon market and eventually stop the death spiral. Positive feedback enforces the lemon market dynamics which drives the good ones out of the market and accelerates the death spiral. New entrants can enter the market and eventually stop the spiral. This can also be done by better informed buyers or more honest sellers. The market mechanism can eventually be regulated by exogenous triggers like governmental corrective initiatives. For a market to become a lemon market there are constraints and an igniting condition is needed. The constraints for obtaining a lemon market are:

- 1) information asymmetry, a condition in which not all relevant information is known to all parties involved so prospective buyers can not accurately assess the value of a product or service before sale is made and sellers can more accurately assess the value of a product or service prior to sale,
- 2) Sellers have no credible ways of disclosing the real quality to buyers,
- 3) the seller "s quality is assessed by buyers acting as von Neumann- Morgenstern maximizers of expected utility.

The igniting condition for a lemon market is that an incentive exists for the seller to market low quality products and services. All parties participating in the communication process would benefit heavily from reducing information asymmetry and avoiding a lemon market. Quantifying the amount of information asymmetry in a communication process is not easy. It is also not straightforward to derive the amount of risk of misinforming, moral hazard and adverse selection.

## BIBLIOGRAPHICAL ANALYSIS OF THE ORIGINAL AKERLOF ARTICLE

It was 40 years ago since Akerlof published his seminal article in the Quarterly Journal of Economics (Akerlof, 1970). So reviewing and profiling the existing literature citing this article is likely to be of use to

researchers and practitioners. This will help to identify the strengths and weaknesses of the existing body of research and to provide clearness in the findings. Our objective therefore was to identify peer reviewed IS journals publishing articles based on the LMT. We limited our research to work published in the database provided by Thompson Scientific also known as the Web of Science. As of the beginning of March 2010 the original Akerlof article was already cited more than 2200 times with a monthly growth of 15 – 20 newly citing publications (last access of the Web of Science database was end of June 2010 and showed 2285 citations). In table 2 we show the number of citing articles by subject area. The subject areas are chosen to be most favorable to publish IS related work, however one cannot exclude that other areas also publish such work. It is also well known that the IS discipline is far from mature and stable and has tentacles in a wide variety of referencing disciplines like business, economics, management and operational research. IT/IS has penetrated in almost every academic field!

Subject Area	Count	Percentage
Economics	824	51.08%
Business	231	14.32%
Business/Finance	184	11.41%
Management	176	10.91%
Law	130	8.06%
Agricultural, Economics & Policy	67	4.15%
Sociology	67	4.15%
Planning & Development	48	2.98%
Social Sciences, Mathematical Methods	47	2.91%
Environmental Studies	46	2.85%
Political Science	41	2.54%
Public Administration	33	2.05%
Information Science & Library Science	31	1.92%
Environmental Science	30	1.86%
Computer Sciences, Information Systems	29	1.80%
Health Policy & Services	29	1.80%
Health Care Sciences & Services	28	1.74%
Mathematics, Interdisciplinary Applications	28	1.74%
Operational Research & Management Science	26	1.61%

**Table 2 – Number of articles citing the seminal Akerlof article by subject area  
(date of inquiry: 25th of March).**

The subject areas in the Web of Science are not treated as mutual exclusive attributes, so articles can be present in more than one subject area. We limited our search to articles only and excluded proceeding papers, reviews, and editorial material. This left a total of 1613 refereed articles at the date of March 2010. We can observe in table 2 that the largest area is economics, being the originating area of the seminal Akerlof article, following by the derived disciplines business, finance and management. The largest area within the IS discipline is Information Science & Library Science with 1.92% of the total articles or 31 refereed articles, followed by Computer Science, Information Systems with 1.80% and 29 articles. Again, it is not easy to reveal IS research articles in the Web of Science by subject area.

An alternative way to dig up IS research articles is done via a search by relevant IS journals, this is shown in table 3. A lot of IS scholars have their favorite IS journals, so a overview by journal title can be of interest. Again this alternative way gives only an indication and not a complete picture of the quantity of IS research articles citing the work of Akerlof, since a lot of IS research articles also are published in typical non-IS research journals like the Journal of Economic Perspectives, Management Science, and Organization Science.

Journal Title	Article count	Percentage
Information Systems Research (ISR)	7	0.61%
Decision Support Systems (DSS)	5	0.44%
Communications of the ACM (CACM)	4	0.35%
European Journal of Operational Research (EJOR)	4	0.35%
Electronic Commerce Research and Applications	3	0.26%
Information & Management (I&M)	3	0.26%
Journal of Management Information Systems (JMIS)	3	0.26%
MIS Quarterly (MISQ)	3	0.26%
Industrial Management & Data Systems	2	0.17%
Journal of Information Science	2	0.17%
J. of Organizational Computing and Electronic Commerce	2	0.17%
ACM Computing Surveys	1	0.09%
Concurrency and Computation-Practice & Experience	1	0.09%
IEEE Trans. on Knowledge And Data Engineering	1	0.09%
Information Processing & Management	1	0.09%
ACM Computing Surveys	1	0.09%
Concurrency and Computation-Practice & Experience	1	0.09%
IEEE Transactions on Knowledge and Data Engineering	1	0.09%
Information Processing & Management	1	0.09%
Information Research and Resource Reports	1	0.09%
Information Sciences	1	0.09%
Intern. J. of Information Management	1	0.09%
Intern. J. on Semantic Web and Information Systems	1	0.09%
J. of Experimental & Theoretical Artificial Intelligence	1	0.09%
Journal of Grid Computing	1	0.09%
Online Information Review	1	0.09%

## CONCLUSION

We have shown that the work of Akerlof has been acknowledged in a variety of disciplines including IS research. The lemon market is indeed a very frequent occurring phenomenon and has been applied by lot of scholars from different academic perspectives. The theory goes back to the essence of markets and human interactions. The emerging e-markets since the end of the last century has given a boost to the application of the theory. We have also shown that the theory has a much broader application domain than e-commerce.

Since the LMT is a meta-theory with a very high level of abstraction it provides way of thinking about other theories and has also links to other theories. We show that Agency theory is one of them with probably the same strength and authority than the LMT. Prospect theory and the theory of organizational trust are also very strongly linked and can provide measures for constructs of the LMT.

The scarcity of empirical evidence of the LMT in IS research is probably the major drawback. Although the theory has strong explanatory power, every empirical situation has its own specific nature which should be carefully and rigorously investigated. The relevance of the LMT lays in its nomological power to make strong generalizing laws.

Finally we think that this chapter can help researcher to find adequate information on the LMT and we hope that it can be of use to new research initiatives in domains as described in this article.

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