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Determination Inventory Level for Aircraft Spare Parts Using Continuous Review Model

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Abstract

In this paper, we determine ordering quantity and reorder point for aircraft consumable spare parts. We use continuous review model to propose a spare part inventory policy that can be used in a aircraft maintenance company in Indonesia. We employ ABC classification system to categorize the spare parts based on their dollar contribution. We focus our research on managing the inventory level for spare parts on class A and B which commonly known as important classes. The result from the research indicates that the continuous review policy gives a significant amount of saving compared to an existing policy used by the company.

Keywords: Inventory, Continuous Review, Ordering Quantity, Reorder Point, ABC Classification System.

1. INTRODUCTION

Inventory management becomes one of primary needs for company to win in a tight global competition. Inventory is a significant asset for any organization. Therefore, it should be managed effectively and efficiently to minimize total cost and to satisfy the customer's requirement. In any practical situation, inventory management faces barriers in the form of a tradeoff between minimizing total cost and maximizing service level. Selecting inventory policy correctly now becomes essential to management as there are many inventory policies provided in the inventory literature.

Garuda Maintenance Facility Aero Asia (GMF-AA) is a company that provides maintenance, repair and overhaul (MRO) service to airlines. Maintenance is activity to maintain aircraft that comprises of line maintenance, base maintenance and engine maintenance. Repair is a activity to improve the broken components in aircraft machine. Overhaul is activity to monitor and give major repair to any object in aircraft, including machine or component.

Spare part is major component that be used in aircraft maintenance process. Aircraft can mostly be categorized into three types. Spare parts which can be rotated among any types of aircraft are called Rotable spare part. Spare parts that have a character same as rotatable spare part but having lower price are called repairable spare part. The spare parts that can be used once or

disposable component are called consumable spare part. The consumable spare parts are very important component in GMF-AA due to their magnitude needs in daily MRO activity. Besides having higher demand than other spare parts, consumable spare parts must be ordered from foreign countries, hence, the replenishment may take a long time. If the spare parts aren't well managed by management, the daily MRO process will probably be interrupted due to the lack of spare part inventories. Moreover, if management decides to hold more spare parts to guarantee that the needs from daily MRO activity must be satisfied, a high inventory cost may occurs. Therefore, controlling consumable spare part accurately is needed by management to ensure that the daily MRO activities run smoothly.

Spare parts inventory system has been studied extensively by many researchers. Croston [1] was probably the first researcher introduced spare part inventory model. The proposed model was developed by integrating single exponential smoothing into inventory model. Kaldschmidt et al. [2] argued that croston method was very important tool to determine inventory level of spare part in supply chain which has intermittent demand. Syntetos and Boylan [3] and Syntetos and Boylan [4] gave critics to croston method which still results a bias in forecasting the spare part. Therefore, Syntetos and Boylan [5] proposed a model for controlling spare part inventory to reduce the level of error in forecasting spare part. Unfortunately, the both models, including croston [1] and Syntetos and Boylan [5] were not suitable to adopt since most inventory environment in real condition is stochastic.

Strijbosch et al [6] developed another model compound bernoulli method and compound poisson method to determine ordering quantity and reorder point. Teunter and Sani [7] gave their research attention on studying the lumpy product. They used order-up-to policy to determine inventory level which previously employed croston method to forecast the demand. Results from this research indicated that integrating croston method and order-up-to policy results in optimal service level. Chang et al [8] implemented r,r,Q policy to manage semiconductor component by assuming stochastic demand. Furthermore, Porras and Dekker [9] determined spare part inventory level at oil company. They used different reorder points to find optimal inventory level in order to minimize total inventory cost. Smidh-Destombes et al. [10] proposed joint optimization of inventory management and maintenance activity. They proposed a heuristic model to derive the optimal solutions and proved that the proposed model performed better than METRIC model. Kilpi et al.[11] developed cooperative strategies for the availability service of repairable aircraft components and determined the factors that give the contribution to the cooperative strategy. They used simulation model to determine optimal cost and used game theory to test the cooperative strategies. Wong et al. [12] investigated the cost allocation problem in context of repairable spare parts pooling with game theoretic model. The results from this study showed that the cost allocation policy affects the companies in making the decision in inventory management. Even many methods have been implemented in determining spare part inventory level, lack of them considering the utilization of continuous review model in reducing total inventory cost.

An important work that must be considered firstly before deciding the correct inventory method is spare part classification. Silver et al. [10] and Tersine [11] proposed ABC classification system to categorize items based on their contribution to dollar volume. They also proposed a suitable inventory models that can be implemented for each classes. Chu et al. [12] developed inventory classification system with fuzzy ABC method. In this proposed method, inventory classification system is not only developed by considering dollar volume's contribution, but also incorporating expert judgments.

In this paper we would like to determine order quantity and reorder point for aircraft spare parts in GMF-AA to minimize total inventory cost. Previously, we use ABC classification system to segment spare part based on their contribution to dollar volume. We utilize continuous review model to determine the inventory level. Continuous review is widely used by researchers to solve the inventory problem and known as an useful and easy method to implement in many areas. Considering aircraft spare parts are very important factors and expensive element, continuous review is suitably implemented due to its ability in maintaining a lower inventory level.

2. LITERATURE REVIEW

2.1 ABC Classification System

ABC classification system is a method that classifies the spare parts based on how critical the spare parts for the company. This method segment the spare parts into three categories, that are A, B and C. A items make up roughly 20 percent of the total number of items and represent 80 percent of the dollar sales volume. B items comprise roughly 30 percent of the items and represent 15 percent of the dollar volume. C items comprise roughly 50 percent of the items and represent only 5 percent of dollar volume [10]. The A items must received more attention from manager. The B items are of secondary importance in relation to class A items and the class C items are relatively unimportant items, hence, the manager can manage them as simple as possible. The steps of ABC classification are described as follows:

1. Listing the spare parts and their demand.
2. Determining the contribution of the spare part by multiplying the demand for each item and the value or price of item.
3. Computing the percentage of spare part contribution by dividing the contribution of each spare part with the total contribution of the spare parts.
4. Sorting the spare parts so that the percentages of spare part contribution are listed from higher value to lower value. The category of spare part could be found by using the above description from [10].

2.2 Continuous Review Model

The continuous review model is one of the inventory policies that manage the inventory through monitoring the inventory level continuously until if the inventory level drops to the reorder point r , the ordering of size Q should be done. Reorder point is determined for each stock keeping unit as demand forecasting during supply time. Reorder point is commonly defined as the summation of demand during lead time and safety stock. The assumptions that be used in continuous review model are as follows:

- a. The demand per unit time is probabilistic with mean D and standard deviation σ
- b. The price of item is not influenced by ordering size.
- c. Reorder point is determined using net inventory.
- d. The backorder cost is set independently to the length time of backorder.
- e. Ordering cost is constant and independent to ordering size.
- f. Holding cost is proportional to the item price and storage time.
- g. Warehouse space, capital and supplier capacity are sufficient.

The notations that will be used in developing continuous review model are as follows:

- D demand in units per unit time
- σ standard deviation of demand per unit time
- A ordering cost incurred for each order size of Q
- k safety factor

- SS safety stock for the buyer
- ES expected number of backorder
- H holding cost per unit per unit time
- π backorder cost per unit backordered
- q the ordering quantity
- f(.) probability density function of standard normal distribution
- F(.) cumulative distribution function of standard normal distribution

Considering the frequency of ordering is (D/q) and ordering cost is A , the ordering cost per unit time can be formulated by:

$$TC_1 = \frac{D}{q} A \dots\dots\dots(1)$$

The holding cost per unit time is determined by multiplying the average inventory level and safety stock and holding cost per unit product. Safety stock is formulated by multiplying safety factor k and standard deviation of demand during lead time. Thus, holding cost per unit time is as follows:

$$TC_2 = H \left(\frac{q}{2} + k\sigma\sqrt{L} \right) \dots\dots\dots(2)$$

The backorder cost per unit time can be found by multiplying the backorder cost per unit backordered and the expected number of unit backordered per unit time. Let x as continue random variable with normal distribution with mean μ and standard deviation $\sigma > 0$. Then, the probability density function of x can be expressed as

$$f(x) = \left(\frac{1}{\sigma\sqrt{2\pi}} \right) e^{\left[-\frac{(x-\mu)^2}{2\sigma^2} \right]} \dots\dots\dots(3)$$

Since the demand during lead time is DL with standard deviation $\sigma\sqrt{L}$, the reorder point can be formulated as $ROP = DL + SS$. Shortage occurs when the demand during lead time is bigger than the inventory level at that period ($x > ROP$). Thus, the expected number of shortage can be expressed by:

$$ES = \int_{x=p}^{\infty} (x - rop)f(x) dx$$

$$ES = \int_{x=q+ss}^{\infty} (x - DL + SS) \frac{1}{\sqrt{2\pi}\sigma\sqrt{L}} e^{\frac{-(x-DL)^2}{2(\sigma\sqrt{L})^2}} dx \dots\dots\dots(4)$$

By substituting $z = \left(\frac{x-DL}{\sigma\sqrt{L}} \right)$ and $dx = \sigma\sqrt{L}dz$ into equation (4), we will find:

$$ES = \int_{z=\frac{ss}{\sigma\sqrt{L}}}^{\infty} (2\sigma\sqrt{L}-SS) \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz$$

$$ES = -SS \int_{z=-\frac{SS}{\sigma\sqrt{L}}}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz + \sigma\sqrt{L} \int_{z=-\frac{SS}{\sigma\sqrt{L}}}^{\infty} z \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz \dots\dots\dots(5)$$

Let $F_s(z)$ is cumulative distribution function dan $f_s(z)$ is probability density function for standard normal distribution with mean 0 and standard deviation 1. By considering equation (5) and the definition of standard normal distribution, we will have:

$$1 - F_s(y) = \int_{z=y}^{\infty} f_s(z) dz$$

$$= \int_{z=y}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz \dots\dots\dots(6)$$

By substituting $w = \frac{z^2}{2}$ into equation 2.6, the expected number of shortage (ES) is given by:

$$ES = -SS \left[1 - F_s\left(\frac{SS}{\sigma\sqrt{L}}\right) \right] + \sigma\sqrt{L} \int_{w=\frac{SS^2}{2(\sigma\sqrt{L})^2}}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-w} dz$$

$$ES = -SS \left[1 - F_s\left(\frac{SS}{\sigma\sqrt{L}}\right) \right] + \sigma\sqrt{L} f_s\left(\frac{SS}{\sigma\sqrt{L}}\right)$$

$$ES = \sigma\sqrt{L} \{f_s(k) - k [1 - F_s(k)]\}$$

$$ES = \sigma\sqrt{L} \psi(k) \dots\dots\dots(7)$$

where $\psi(k) = \{f_s(k) - k[1 - F_s(k)]\}$

$f_s(k)$ is probability density function of standard normal distribution and $F_s(k)$ is cumulative distribution function of standard normal distribution, respectively. Therefore, the backorder cost per unit time is formulated by

$$TC_3 = \left(\frac{D}{q}\right) \pi \sigma\sqrt{L} \psi(k) \dots\dots\dots(8)$$

Total inventory cost comprises of ordering cost, holding cost and backorder cost, hence, the cost can be expressed by:

$$TC(q,k) = \left(\frac{D}{q}\right) A + H \left(\frac{q}{2}\right) + k\sigma\sqrt{L} + \left(\frac{D}{q}\right) \pi \sigma\sqrt{L} \psi(k) \dots\dots\dots(9)$$

Decision variable q and k can be found by taking the first partial derivatives of $TC(q,k)$ with respect to q and k and equating them to zero.

$$\frac{\partial TC_{total}(q,k)}{\partial k} = 0$$

$$\frac{-D}{q^2} A + \frac{H}{2} - \frac{D}{q^2} \pi \sigma\sqrt{L} \psi(k)$$

$$q = \sqrt{\frac{2D(A + \pi \sigma\sqrt{L} \psi(k))}{H}} \dots\dots\dots(10)$$

$$\frac{\partial TC_{\text{total}}(q,k)}{\partial k} = 0$$

$$\partial\sqrt{LH} + \frac{\pi D\sigma\sqrt{L}(F_s(k)-1)}{q} = 0$$

$$F_s(k) = 1 - \frac{qH}{\pi D} \dots\dots\dots(11)$$

It can be seen in equation (10) and (11) that both equations express the relationship between q and k . Therefore, the solution of the above continuous review model can be found by searching the convergence values of q and k which minimizes total cost. Considering the iterative procedure from Ben-Daya and Hariga [13], the algorithm to solve the continuous review is as follows:

1. Set the initial value of q by

$$q = \sqrt{\frac{2AD}{H}}$$
2. Substitute q into equation (11) to find k .
3. Find the new value of q by using equation (10).
4. Find the new value of k by using equation (11).
5. Repeat step 3-4 until no changes occur in the values of q and k .
6. Compute total cost with equation (9) by employing the convergence values of q and k in step 5.

3. RESEARCH METHODOLOGY

In first stage of our research we employ ABC classification to categorize 60 consumable spare parts. The classification is done under consideration of dollar volume contribution for each spare part. Secondly, as we intend to focus in determining the inventory level of spare part in class A and B, we provide their all input parameters of spare parts including, the mean of demand per unit time, standard deviation of demand and inventory cost, including holding cost, ordering cost and shortage cost. The mean and standard deviation of demand for selected spare parts is determined from demand data during ten years. Holding cost is determined by considering interest rate, storage cost and labor cost. Shortage cost is determined from the added cost that must be included in rush order. In this research, it is formulated by 20 % of spare part price. The ordering cost is determined by considering internet cost as a major component in ordering activities and administration cost. Table 1 presents the input parameters and inventory cost of 24 spare parts studied in this research. The final stage of this research, we determine the inventory level of the spare parts by using an iterative procedure described in previous section.

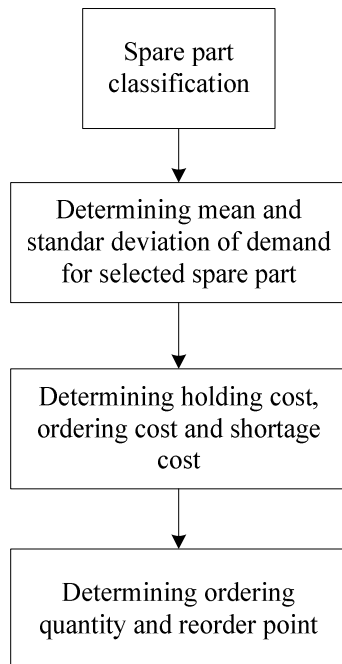


FIGURE 1: Research Methodology.

No.	Spare part	Mean (unit)	Standar deviation (unit)	Lead time (day)	Holding cost (IDR)	Shortage cost (IDR)
1	CH34736	58	61	44	393,432	1,191,674
2	335-299-401-0	90	180	95	75,766	132,788
3	S9413-11	96	83	21	288,694	842,545
4	MFFA632/2	6	10	23	6,292,279	20,854,498
5	740001	98	107	10	93,357	191,424
6	D717-01-100	8	7	23	504,483	1,561,843
7	FK16588	5	4	21	1,721,942	5,620,039
8	088-1031-006	6	5	11	867,097	2,770,557
9	KB29665	32	18	23	174,458	461,759
10	4L83-046	102	167	7	550,175	1,714,149
11	QA03963	26	19	29	127,021	303,636
12	5709-4	14	7	35	358,843	1,076,377
13	362-509-9002	7	7	29	397,937	1,206,690
14	65-90305-15	44	33	7	106,871	236,471
15	16135-62	11	8	7	340,241	1,014,369
16	335-299-401	169	185	26	41,971	20,137
17	453A1810-33	5	4	23	364,744	1,096,046
18	AB0473993	14	6	88	151,381	384,838
19	740007	76	62	20	58,489	75,198
20	QA03362	23	65	11	332,351	988,069

21	MS20995C32	16	19	44	58,245	74,382
22	65-90305-20B	87	70	11	76,315	134,618
23	AC9380F4010	16	18	8	149,125	377,316
24	F5746293620200	25	69	10	242,024	686,979

TABLE 1: Input Parameters and Related Inventory Costs of Spare Parts.

4. RESULTS AND DISCUSSIONS

4.1 Spare Part Classification

From ABC classification we found that class A comprises of 11 spare parts, class B comprises of 13 spare parts and class C comprises of 36 spare parts. Spare parts in class A give the contribution about 79.6%, spare parts in class B contributes 14.7% and spare parts in class C contributes 5.6% to rupiah volume. The results from ABC classification is given in table 2. In this research, we focus to manage the inventory in class A and class B due to its criticality for management. 24 spare parts in this classes give significant contribution (94.3%) to the management, hence, controlling them tightly may results in significant amount of inventory cost saving. One of the tight inventory management policies that can be used to manage spare parts in this classes are continuous review. In practical situation, the continuous model has an ability to maintain lower inventory level although it needs more attention from inventory manager. Even the ABC classification can be used to categorize the spare part, considering more factors such as spare parts severity and spare part severity, may provide more attractive results. Each spare part may have different severity level based on its usefulness in aircraft machine.

4.2 Determination of Ordering Quantity and Reorder Point

Ordering quantity (q) and reorder point (ROP) are determined by employing an iterative procedure described in above section. We develop list of program using MATLAB 2009a. The results from MATLAB are given in table 3. As can be seen in this table that some spare parts such as CH34736, S9413-11, 4L83-046 have reorder point level higher than its ordering quantity. It is understandable, because the spare parts have high uncertainty indicated by high standard deviation of demand. Having high standard deviation of demand, the model will produce high safety stock. This condition absolutely will increase the reorder point level.

No	Spare part	Class	No.	Spare part	Class	No.	Spare part	Class
1	CH34736	Class A	21	MS20995C32	Class B	41	OF25-021	Class C
2	335-299-401-0	Class A	22	65-90305-20B	Class B	42	BACC63BV14B7SN	Class C
3	S9413-111	Class A	23	AC9380F4010	Class B	43	FK20158	Class C
4	MFFA632/2	Class A	24	F5746293620200	Class B	44	BACR15BB6D7C	Class C
5	740001	Class A	25	ABS0368-01	Class C	45	MS29526-2	Class C
6	D717-01-100	Class A	26	BV03112-03-33	Class C	46	BACB30NN4K4	Class C
7	FK16588	Class A	27	2315M20-3	Class C	47	ABS0367-030	Class C
8	088-1031-006	Class A	28	ASPF-S-V06	Class C	48	ABS0604-4	Class C
9	KB29665	Class A	29	65-90305-17	Class C	49	F5746293620100	Class C
10	4L83-046	Class A	30	QD1004-125	Class C	50	BACR15GF8D7	Class C
11	QA03963	Class A	31	69-41868-3	Class C	51	BACN10YR3C	Class C
12	5709-4	Class B	32	CA00075A	Class C	52	MS29513-334	Class C

13	362-509-9002	Class B	33	FK20159	Class C	53	S9413-11	Class C
14	65-90305-15	Class B	34	77870949	Class C	54	BACN10JC4CD	Class C
15	16135-62	Class B	35	65-90305-59	Class C	55	65B10920-171	Class C
16	335-299-401	Class B	36	BACH20X3	Class C	56	4551	Class C
17	453A1810-33	Class B	37	QA06123	Class C	57	1683	Class C
18	AB0473993	Class B	38	332A1034-25	Class C	58	M83248/1-906	Class C
19	740007	Class B	39	RG1969	Class C	59	BACB30VF4K12	Class C
20	QA03362	Class B	40	65C27738-2	Class C	60	BACW10BP41CD	Class C

TABLE 2: Spare Part Classification.

No	Spare part	Ordering quantity (unit)	Reorder Point (unit)
1	CH34736	21	32
2	335-299-401-0	108	24
3	S9413-11	17	36
4	MFFA632/2	2	3
5	740001	16	27
6	D717-01-100	2	3
7	FK16588	1	2
8	088-1031-006	1	2
9	KB29665	4	10
10	4L83-046	20	37
11	QA03963	5	9
12	5709-4	2	5
13	362-509-9002	2	3
14	65-90305-15	4	9
15	16135-62	1	2
16	335-299-401	20	12
17	453A1810-33	1	2
18	AB0473993	2	9
19	740007	12	33
20	QA03362	12	11
21	MS20995C32	11	2
22	65-90305-20B	12	20
23	AC9380F4010	3	4
24	F5746293620200	12	11

TABLE 3: The Optimal Ordering Quantity (q) and Reorder Point (ROP).

No	Spare parts	Total cost of continuous review (IDR)	Total cost of existing policy (IDR)	Percentage of saving (%)
1	CH34736	18,187,000	4,902,703	-271
2	335-299-401-0	8,169,300	13,862,968	41
3	S9413-11	13,901,412	20,078,123	31
4	MFFA632/2	33,837,686	70,745,161	52
5	740001	3,821,039	3,473,933	-10
6	D717-01-100	2,151,860	79,050,683	97
7	FK16588	4,144,690	24,162,508	83
8	088-1031-006	1,976,609	11,963,751	83
9	KB29665	2,020,408	3,719,859	46
10	4L83-046	30,401,784	20,010,096	-52
11	QA03963	1,593,800	2,986,025	47
12	5709-4	2,003,358	3,149,088	36
13	362-509-9002	1,805,116	17,474,439	90
14	65-90305-15	1,291,958	2,725,353	53
15	16135-62	1,055,404	9,176,663	88
16	335-299-401	6,794,353	5,371,262	-26
17	453A1810-33	909,717	1,967,814	54
18	AB0473993	1,259,292	3,064,476	59
19	740007	2,373,446	3,327,663	29
20	QA03362	7,506,171	10,635,221	29
21	MS20995C32	612,238	2,238,758	73
22	65-90305-20B	2,211,054	4,131,125	46
23	AC9380F4010	993,351	1,752,534	43
24	F5746293620200	5,551,371	7,958,346	30
Total		154,572,418	309,928,552	31

TABLE 4: The Comparison of Continuous Review Total Cost and Existing Policy Total Cost.

The proposed continuous review policy gives significant average savings of 31% compared to an existing policy which is used by the company. The comparison of proposed policy and an existing policy is resumed in table 4. This table shows the total inventory cost of proposed policy and an existing policy and presents the savings of moving from existing policy to proposed policy. The company uses a periodic review policy which based on his experience in controlling the spare parts. The parameters in an existing policy are determined using the experience of warehouse operator which may fail to detect the true inventory level. Moreover, as we know from inventory literature that periodic review policy will make inventory level higher than continuous review. However, even the proposed policy results in lower cost compared to existing policy, interestingly some spare parts show different condition. Spare parts CH34736, 740001, 4L83-046 and 335-299-401 show that an existing policy performs better than continuous review policy. It can be understood that the continuous review model may fail to result better inventory policy since the demand of the spare parts is too lumpy. The other models such as the model which accommodated poisson demand or compound poisson demand probably more suitable to

perform in this condition. It is due to the both model's ability to capture the essence of the demand. Furthermore, this study used the spare part demand from spare part data in warehouse, therefore the demand in real aircraft maintenance activity is neglected. It should be noted here that, assuming demand to be independent with the real spare part demand in maintenance may result in higher cost since there a gap between inventory management and maintenance activity. To develop the efficiency of company, both activities should be synchronized in one decision model to decrease the total cost incurred in the system. An integrated information system which integrates the information from both activities is also required by the company to increase the system feasibility in enhancing the capability of the company in reducing total cost.

5. CONCLUSIONS

In this paper, we determine the ordering quantity and reorder point of aircraft spare part using continuous review model. Previously, we classify the 60 spare parts by using ABC classification system. The results from this research show that the proposed continuous review model results in lower total cost compared to an existing policy. The amount of average savings that can be gained by this proposed policy is about 31%. However, an existing policy still performs better in reducing total cost for some spare parts.

Future research can look into determining the inventory level of spare part which total cost has not been minimized by continuous review model. The inventory model accommodating poisson demand or compound poisson demand may suitable to use in solving this problem. Furthermore, the spare part classification can be extended by integrating other qualitative attribute into ABC classification system. The attribute such as spare part severity and spare part criticality probably can be included into spare part classification. The fuzzy method can be used to assess the level of spare part severity and criticality. Other future research direction may focus on integrating inventory decision with maintenance activity. Our study assumes that the demand parameter was a given parameter, however it may not represent the actual system in aircraft repair facility hence, integrating inventory decision with the schedule of maintenance may give valuable insights.

6. REFERENCES

- [1] Croston, J.D. "Forecasting and stock control for intermittent demands". *Operational Research Quarterly*, Vol. 42(3), pp. 289–303.1972.
- [2] Kaldschmidt, M., Zotteri, G., and Verganti, R. "Inventory management in a multi-echelon spare parts supply chain", *International Journal of Production Economics*, Vol. 81, pp. 397-413. 2003.
- [3] Syntetos, A.A. and Boylan, J.E. "On the bias of intermittent demand estimates". *International Journal of Production Economics*, Vol. 71, pp.457–466. 2001.
- [4] Syntetos, A.A. and Boylan, J.E. "The accuracy of intermittent demand estimates". *International Journal of Forecasting*, Vol. 21, pp. 303–314. 2005.
- [5] Syntetos, A.A. and Boylan, J.E. "On the stock control performance of intermittent demand estimators". *International Journal of Production Economics*, Vol. 103, pp. 36–47. 2006.
- [6] Strijbosch, L.W.G., Heuts, R.M.J. and Schoot, E.H.M. "Improved Spare Parts Inventory Management: A Case Study," Discussion Paper 1998-135, Tilburg University, Center for Economic Research. 1998.
- [7] Teunter R. and Sani B. "Calculating order-up-to levels for products with intermittent demand", *International Journal of Production Economics*, Vol. 118, pp. 82–86.2009.

- [8] Chang P.L., Chou Y.C. and Huang M.G. "A r,r,Q inventory model for spare parts involving equipment criticality", *International Journal of Production Economics*, Vol.97, pp. 66–74. 2005.
- [9] Porras E. and Dekker R. "An inventory control system for spare parts at a refinery: An empirical comparison of different re-order point methods", *European Journal of Operational Research*, Vol. 184, pp. 101–132. 2008.
- [10] Smidt-Destombes, K.S., Van Der Heijden, M.C. and Van Harten, "A. Joint optimisation of spare part inventory, maintenance frequency and repair capacity for k-out of N system", *International Journal of Production Economics*, Vol. 118, pp. 260-268.2009.
- [11] Kilpi, J., Toyli, J. And Vepsalainen, A. "Cooperative strategies for the availability service of repairable aircraft components", *International Journal of Production Economics*, Vol 117, pp. 360-370. 2009.
- [12] Wong, H., Van Oudheusden, D. And Cattrysse, D. "Cost allocation in spare parts inventory pooling", *Transportation Research Part E*, Vol. 43, pp. 370-386. 2007.
- [13] Silver, E.A., Pyke, D.F., and Peterson, R. *Inventory Management and Production Planning and Scheduling*. New York : John Willey & Sons. 1998.
- [14] Tersine, R.J. *Principles of Inventory and Material Management*. New Jersey : Prentice Hall, 1994
- [15] Chu C.W., Liang G.S., Liao C.T. "Controlling inventory by combining ABC analysis and fuzzy classification", *Computers & Industrial Engineering*, Vol. 55, pp. 841–851. 2008.

Investigating the Influence of Firm Characteristics on Export Marketing Strategies and Export Performance

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Abstract

The export performance has been studied to a great extent while fewer researches have focused the export activities of developing countries. Firm characteristics have always been found to impact export performance considerably. Furthermore, the marketing strategy applied by the firm has been an important issue related to performance. In this paper, the relationships among firm characteristics, export marketing strategies as well as export performance were investigated on the export of medical disposable products in Malaysia. Data was gathered from 22 firms by the means of a questionnaire for which the reliability of 0.85 was achieved. The statistical Chi-Square test for independence was applied for testing the hypotheses via SPSS. The results indicated that several internal firm factors namely, market knowledge, commitment, international experience and innovation affected the application of adaptation strategies. Moreover, the use of adaptation strategies and the export performance were significantly related. Finally it was concluded that firm characteristics could influence export performance indirectly and through marketing strategies.

Keywords: Firm Characteristics, Export Marketing Strategy, Export Performance, Medical Disposable Products, Malaysia.

1. INTRODUCTION

According to broad studies on export performance, there has always been found a relationship between internal firm factors and the performance [1]. But what is less explored is the indirect impact of internal firm factors on export performance and through export marketing strategies; besides, fewer researches have focused the export of developing countries. Since improving export performance is the goal of many firms as well as governments, it is of high importance to get more acquainted with key factors which can improve not only the knowledge of export managers but also the theoretical literature; therefore, more work is needed in this field. This paper which is on particular products and a specific region, examines the relationship between firm characteristics and marketing strategies and the influence of these strategies on export performance.

The rest of paper is organized as follows, conceptual framework, literature review and hypotheses are presented in the next section. After that, methods and materials are explained.

Then, the following section presents and discusses the obtained results. Finally, conclusion, limitations and future work are signified.

2. LITERATURE REVIEW AND HYPOTHESES

2.1 Conceptual Framework

Figure 1 demonstrates the conceptual framework of the current study. This framework indicates that firm's internal characteristics influence marketing strategies [2] and that export marketing strategies affect export performance [3]. Firm characteristics represented in the figure involve firm age, firm size, international experience, market knowledge and research, education, innovation and commitment. And the marketing strategy contains the firm decision to either standardize or adapt the marketing mix. The hypotheses are also shown and their construct will be explained subsequently.

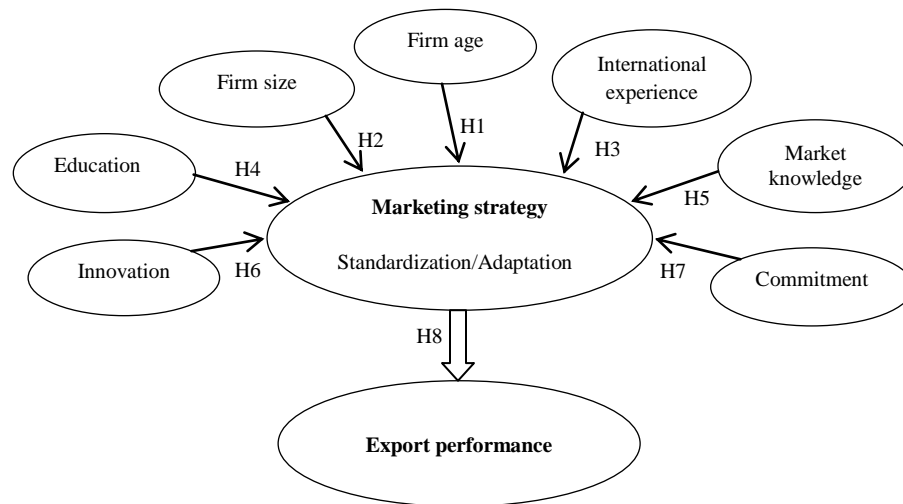


FIGURE 1: Conceptual Framework.

2.2 Export Marketing Strategies

Export marketing strategy responds to market forces by the use of marketing mix, to be precise product, price, promotion and place. Marketing strategies include: product strategy like product design and warranties; price strategy that should be based on customer demands; promotion strategy that promotes performance by encouraging consumers; place strategy that focuses on distribution [4]. The key factor of marketing strategy in the international market is the decision of standardization or adaptation to foreign markets conditions [3]. Standardization is when the firm uses the same marketing strategies in home market as well as target market, or when world customers are analyzed and a standard marketing mix is considered for all markets; while in applying adaptation, the marketing mix is formed with specific needs of each market segment [5]. Standardization leads to an easier business; however, it has many opponents who believe that adaptation is the key to success [6]. The critics consider the change and believe that standardization cannot create competitive advantage; therefore, they believe that firms should use adaptation strategies in order to identify the opportunities and create competitive advantage [7].

2.3 Firm Characteristics

The number of employees, firm age, information, communication, and innovation capacity are some of firm characteristics [8]. It is approved that firms must have an accurate and sufficient combination of key resources in order to design and implement marketing strategies [9]. Although an exporting firm may access many resources, those related to human, marketing, finance and

information aspects are the most significant for designing a precise marketing strategy [10]. As mentioned in [11], in order to utilize resources, firms need capabilities and complex skills so that they can coordinate activities in a way to achieve the highest advantage.

2.3.1 Firm Age

Age of firm is generally an indicator of learning throughout the time and since engaging in export activities takes a long time, firm age is a very important factor. Some researchers have considered a relationship between firm's age and the export performance. They believe that firms in early stages can have better performance if they are more adaptive [12].

H1: Older firms are more likely to adapt marketing strategies.

2.3.2 Firm Size

Another firm characteristic is the size for which the number of employees is the best variable [13]. Firms should be large enough in order to be capable of competing in the global market. According to the increasing competition and improvements in communication networks, larger firms have better advantages in the international market. The relationship between size and performance cannot be generalized since it depends on export strategies [14]. Larger firms are more likely to adapt in contrast with smaller firms who have restricted resources [15].

H2: Larger firms are more likely to adapt marketing strategies.

2.3.3 International Experience

International experience is a source of competitive advantage since it leads to designing appropriate strategies [16]. When a firm has more international experience, there is more likelihood of not just using standardization for gaining worthy results [17]. A firm with international experience distinguishes environmental differences, selects the most attractive market and is more probable to adapt marketing strategies [3]. Evidence shows that the management's international business experience and training is an advantage that has a significant relationship with price adaptation and impacts performance [18].

H3: Firms with more international experience are more likely to adapt marketing strategies.

2.3.4 Education

The employees of firms with weak performance were generally less educated and had fewer skills; yet, some researchers did not observe any specific influence of education on export [19]. It is suggested that education and experience would not create a better performance without a correct dispersion of information in the firm [20].

H4: Firms with more educated employees are more likely to adapt marketing strategies.

2.3.5 Market Knowledge and Research

Another factor is market knowledge which is very vital for decision making and is a competitive advantage for the firm. More market knowledge makes the firm more active in pursuing the external opportunities and international development [21]. After doing market research and considering market demands, the marketing manager identifies the target market and discovers the best marketing strategies based on the features of target market and by the use of marketing information [22]. A firm without knowledge of market demands and customers will face troubles in employing market opportunities [23]. Studies on export have shown that many exporters ignore marketing research and they encounter sever problems in analyzing the foreign market and taking advantage of it [24].

H5: Firms with more market knowledge and research are more likely to adapt marketing strategies.

2.3.6 Innovation

Technology innovation affects export activities by increasing the production, reducing costs and developing new products for international markets. There exist three kinds of innovation specifically, product innovation such as new products or changes in design and packaging; process innovation like introduction of quality control and information technology; and finally management and organizational innovation, for instance introduction of strategic planning [25].

According to literature, innovation is a key factor for the firm performance and it will perform better by accepting new ideas [26]. A firm that changes its activities toward new ideas and applies innovation as a valuable resource is likely to use higher levels of product adaptation [27].

H6: Firms applying more innovation are more likely to adapt marketing strategies.

2.3.7 Commitment

The last firm characteristic discussed in this work is export or management's commitment. Less committed managers tend to standardized strategies since they are performed more easily [18]. Committed firms allocate more resources to export activities and have long term planning which leads to appropriate marketing strategies considering market demands [28]. Uncertainty is diminished by commitment and marketing strategy is implemented effectively which results in a better performance [13].

H7: More committed firms are more likely to adapt marketing strategies.

2.4 Export Performance

There are many definitions of export performance and the most well-known one defines it through sales volume, sales increase, profit, and export intensity [1]. However this definition does not take into account the qualitative aspects such as manager's satisfaction or success in achieving strategic goals like the increase in market share [3]. Moreover, export performance measurement methods can be divided to two categories that are quantitative and qualitative [29]. The relationship between marketing strategy and export performance is a famous case of study in international marketing researches and marketing strategy is known as a significant factor of export performance; though the results have been different in some studies [4]. Strategy impacts performance directly while firm characteristics influence it indirectly and through strategies [30]; hence, it can be implied that performance is the outcome of coordination between strategy and resources and capabilities of firm as well as environment.

H8: Firms adapting marketing strategies are more likely to have a better performance.

3. METHODS AND MATERIALS

3.1 Data Collection

This study examines exporting firms in Malaysia and in order to narrow the research, the export of medical disposable products is focused. The list of firms was provided from internet and a questionnaire was used so as to gather data. The questionnaire was mailed to the sample after pre-testing and it was asked to be completed by firm's export or marketing manager. It was mailed to 89 firms out of which 22 were returned and usable; consequently, the response rate is 24.7%.

3.2 Measuring Instrument

All variables of this work have been already applied by researchers; besides, validated scales are employed in the questionnaire for obtaining valid measures. Three main sections form the measuring instrument from which the first section gathers information about firm characteristics; section two asks questions about marketing strategies and the last part evaluates the export performance.

In the first section, the respondents are asked to signify the number of years the firm is working and those who have been working for less than 20 year are considered young. Then for discovering the firm size, the number of full-time employees is requested and firms are assumed large if there are more than 100 employees. After that, for gaining information about the international experience, the firm's as well as manager's export experience are taken into account. Lastly, Likert scales are used for answering questions about employees level of education, the amount of market knowledge and research, the extent of innovation employed in the firm and commitment to the export for which the degree of allocated resources and long-term planning are two key factors. The second part uses detailed dimensions of the four marketing mix elements (product, price, promotion, and place) for evaluating export marketing strategies. The questions are presented in a way so as to distinguish whether these strategies are adapted or

standardized by the firm. For this purpose, the marketing method of the firm's product in home and target markets is examined via five-point Likert scales where 1 shows totally the same and 5 indicates totally different. The last section assesses the export performance by the use of interval as well as Likert scales through different factors such as: annual sales volume, export intensity, sales volume, profitability, goals achievement, level of satisfaction, and overall performance.

With the intention of computing the reliability of the questionnaire, Cronbach's Alpha is calculated and the result of 0.85 indicates a reasonable reliability; in addition, the reliability of all questions is above 0.06 which justifies their involvement in the analysis.

It must be noted that based on the responses for export marketing strategies, firms are classified to two groups of standardization and adaptation. Furthermore, they are categorized to high-performed and low-performed by means of replies to questions of performance section.

3.3 Analytical Method

The method of analyzing data applied in this paper is Chi-Square test for independence. This test is used to determine whether two categorical variables are related. It compares the frequency of cases found in various categories of one variable across the different categories of another variable. Consequently, this test is appropriate for this study seeing the hypotheses and through classification of firms based on adaptation as well as performance level. This statistical test is carried out via SPSS and the significance value needs to be 0.05 or smaller to be significant with the probability of 95%.

4. RESULTS AND DISCUSSION

The accepted analytical method is applied and the hypotheses are tested. Cross tabulation is represented in Table 1 and the obtained chi-square results are depicted in Table 2.

As indicated in Table 2, the result is not significant ($p > 0.05$) for the first hypothesis and no relationship is seen between the firm age and employing adaptation strategies. It must be noted that the age of firm may affect performance directly which is not focused in this paper; still, some researchers have considered a relationship between these two variables since age is an indicator of learning [12].

The second hypothesis is not supported ($p > 0.05$) according to Table 2 so the size of firm and adaptation strategy are not related based on the existing dataset; although it is reported larger firms are more likely to adapt due to their sufficient resources [15]. The relationship between firm size and performance is not examined in this work; and it is supposed to be dependent on export strategies [14].

The third hypothesis with the obtained significance level of less than 0.05 is supported (Table 2) which shows that international experience affects the choice of adaptation strategies. In other words, based on Table 1 the proportion of firms that are exporting more than 10 years and adapt marketing strategies (72.7%) is significantly different from the proportion of firms that have less international experience and employ adaptation strategies (27.3%). It can be stated that since more experience leads to a better understanding of environmental threats and opportunities, it gets easier for experienced firms to adapt the marketing strategies. It is suggested that for firms with more international experience, the likelihood of adapting marketing strategies is more [3, 17, 18].

As shown in Table 2, no support is found for hypothesis four ($p > 0.05$) and no relationship is noticed between employees' level of education and the use of adaptation strategies in the firm. And about the influence of education on performance, researchers did not observe any specific impact [19, 20].

			Marketing strategy (%)	
			standardization	Adaptation
Age	Young	within strategy	70	33.3
		of total	31.8	18.2
	Old	within strategy	30.0	66.7
		of total	13.6	36.4
Size	Small	within strategy	63.6	36.4
		of total	31.8	18.2
	Large	within strategy	36.4	63.6
		of total	18.2	31.8
Experience	Less	within strategy	72.7	27.3
		of total	36.4	13.6
	More	within strategy	27.3	72.7
		of total	13.6	36.4
Education	Not at all	within strategy	50.0	50.0
		of total	22.7	22.7
	Very much	within strategy	50	50
		of total	27.3	27.3
Market research	Not at all	within strategy	75.0	20.0
		of total	40.9	9.1
	Very much	within strategy	25.0	80.0
		of total	13.6	36.4
Innovation	Not at all	within strategy	72.7	27.3
		of total	36.4	13.6
	Very much	within strategy	27.3	72.7
		of total	13.6	36.4
Commitment	Not at all	within strategy	80.0	25.0
		of total	36.4	13.6
	Very much	within strategy	20.0	75.0
		of total	9.1	40.9
Performance	Low	within strategy	72.7	18.2
		of total	36.4	9.1
	High	within strategy	27.3	81.8
		of total	13.6	40.9

TABLE 1: Cross Tabulation.

For the fifth hypothesis a significant difference is observed between firms that employ adaptation or standardization strategies regarding market knowledge and research. Explicitly and according to Table 1, 80% of firms that use adaptation strategies declared that market knowledge and research in the firm is very much and 75% of firms who standardize marketing strategies stated a shortage of market knowledge in the firm. The reason is that by doing more marketing research and having more foreign market knowledge, opportunities can be analyzed with more certainty, and the marketing mix can be adapted according to target market. This result approves previous reports which proposed market knowledge and research enables the firm to overcome the problems of analyzing the foreign market and helps employing market opportunities as well as discovering the best marketing strategies [22, 23, 24].

Hypothesis six is supported and it can be concluded that innovation practices affect the use of adaptation strategies (Table 2). To be exact, among all firms that utilize adaptation strategies 72.7% declared that the firm is engaged in innovation activities very much while just 27.3% affirmed a little application of innovation in the firm as presented in Table 1. The reason is the fact that accepting new ideas is an indicator of adaptation ability. This result is consistent with the statement that a firm which changes its activities toward new ideas and applies innovation is likely to use higher levels of product adaptation [27].

It is indicated in Table 2 that for the seventh hypothesis the result is significant ($p=0.01$); thus it is implied that commitment and adaptation strategies are related. Specifically, 75 % of firms that adapt marketing strategies are more committed that is to say they allocate more amounts of supporting resources and have long-term planning for their export activities; though less committed firms mostly employ standardization strategies (Table 1). It is also stated in the literature that less committed managers tend to standardized strategies since they are performed more easily [18] and committed firms apply appropriate marketing strategies considering market demands [28].

The last hypothesis which is about the relationship between the use of adaptation strategies and export performance is supported based on Table 2 ($p<0.05$); consequently there exists a relationship and firms that are more likely to have a better performance use adaptation strategies more. To be precise and as shown in Table 1, most of firms that employ adaptation strategies have a higher performance (81.8%) in comparison with those that have a lower performance (18.2%). In earlier studies, marketing strategy has been known to be a significant factor of export performance that affects it directly; yet, in some studies the results have been dissimilar [4, 30].

Hypothesis	Chi-square value	Sig. level	Analysis	Result
H1	2.933	0.086	firm age/adaptation strategy	Not supported
H2	1.636	0.201	firm size/ adaptation strategy	Not supported
H3	4.545	0.033*	international experience/adaptation strategy	Supported
H4	0.000	1.000	education/ adaptation strategy	Not supported
H5	6.600	0.010*	market knowledge/ adaptation strategy	Supported
H6	4.545	0.033*	innovation/ adaptation strategy	Supported
H7	6.600	0.010*	commitment/ adaptation strategy	Supported
H8	6.600	0.010*	adaptation strategy/ export performance	Supported

* $p < 0.05$ (significant difference at 95% confidence)

TABLE 2: Hypotheses Test Results.

To sum up, the results indicate the significant impact of some firm characteristics on adaptation strategies. The first internal firm factor that plays a chief role in the application of adaptation strategies is market knowledge and research. The next factor associated with adaptation strategies is the firm's commitment. After that, international experience and innovation are equally related to the employment of adaptation strategies. A firm with possession of these features can better consider the demands of the export markets. And finally it is clear that adaptation

strategies have a considerable influence on the export performance of the firm. As the findings suggest, a better performance can be achieved through coordinating to the export markets. Hence, it is confirmed that some firm characteristics can have a positive effect on export performance indirectly and through appropriate selection of marketing strategies.

The significance of the current work is that it concentrates on a specific region and particular products. Besides, it presents diverse aspects of firm characteristics, marketing strategies and export performance. This work helps Malaysian as well as other exporting firms in their attempts to improve the export performance. It presents various internal factors associated with adaptation strategies explicitly; market knowledge and research, commitment, international experience and innovation. In addition, it indicates that firms who adapted export marketing strategies performed better than those who used standardized strategies. Therefore to be effective in the application of adaptation strategies, the management should: develop market knowledge and research for discovering different opportunities and making decisions; improve commitment to export strategies through appropriate planning and implementation; promote international experience via visiting abroad; and finally increase innovation activities in the firm. Furthermore, to advance export performance, the management should consider adapting export marketing strategies rather than standardization.

5. CONCLUSION

In this paper, export of specific products from Malaysia is investigated and the reason is that export activities in developing countries have not been considered very much. Focus of this study is on the relationship among firm characteristics, marketing strategies and performance. The results indicate that among investigated factors, market knowledge and research, commitment, international experience, and innovation affect marketing strategies and the choice of standardization or adaptation; that is to say firms that are stronger in these features use adaptation strategies more. It is also concluded that there is a relationship between marketing strategies and export performance; that is to say adaptation strategies lead to a better performance. Therefore, firms may develop their export performance by improving the mentioned features and through employing adaptation strategies. The results of this study can be used as guidelines by exporters who desire a better performance.

6. LIMITATION AND FUTURE WORK

In this work, the export of medical disposable products from Malaysia is investigated; therefore the results should be used cautiously and other products as well as other developing countries can be selected later. In addition, more internal factors along with external factors of the firm will be explored in following researches. Another concern is about comparing the direct and indirect impact of firm characteristics on export performance that will be examined in future. And finally, other statistical tests will be applied in order to find more accurate results.

7. REFERENCES

- [1] C.S. Katsikeas, L.C. Leonidou and N.A. Morgan. "Firm-level Export Performance Assessment: Review, Evaluation and Development". *Journal of Academy of Marketing Science*, vol. 28(4), pp. 493-511, 2000.
- [2] J. Barney. "Firm Resources and Sustained Competitive Advantage". *Journal of Management*, vol. 17(1), pp. 99-120, 1991.
- [3] S.T. Cavusgil and S. Zou. "Marketing strategy-performance relationships: an investigation of the empirical link in export market ventures". *Journal of Marketing*, vol. 58, pp. 1-21, 1994.

- [4] F.M. Moghaddam, A. Bakar, B. Abdul, S. Zaleha, A. Rasid, and H. Darestani. "The Influence of Export Marketing Strategy Determinants on Firm Export Performance : A Review of Empirical literatures Between 1993-2010". *IJFPSS*, vol. 1(2), pp. 26–34, 2011.
- [5] G. Fisher. *International Business*. Australia: pearson education 3rd Edition, 2006.
- [6] S.P. Douglas and W. Yoram. "The Myth of Globalization". *Columbia Journal of World Business*, pp. 19-30, 1987.
- [7] H.V. Wortzel and L.H. Wortzel. *Global strategic management: the essentials*, New York: John Wiley & Sons. 2nd Edition, 1990.
- [8] G. Nassimbeni. "Technology, innovation capacity, and the export attitude of small manufacturing firms". *Research Policy* vol. 30, pp. 245–262, 2001.
- [9] N.A. Morgan, W.V. Douglas and B.S. Bodo. "Resource-Performance Relationships in Industrial Export Ventures: The Role of Resource Inimitability and Substitutability". *Industrial Marketing Management*, vol. 35(5), pp. 621–633, 2006.
- [10] L.C. Leonidou. "An Analysis of the Barriers Hindering Small Business Export Development". *Journal of Small Business Management*, vol. 42(3), pp. 279–302, 2004.
- [11] A. Krasnikov and S. Jayachandran. "The Relative Impact of Marketing, Research-and-Development, and Operations Capabilities on Firm Performance". *Journal of Marketing*, vol. 72, pp.1–11, 2008.
- [12] M. Soderbom. "Size and efficiency in Africa manufacturing firms: Evidence from firm – level panel data". *Journal of Development Economics*, vol. 71, pp. 369–394, 2004.
- [13] C.C. Julian. "Export Marketing Performance: A Study of Thailand Firms". *Journal of Small Business Management*, vol. 41(2), pp. 213-220, 2003.
- [14] A. Bonarccorsi. "On the Relationship between Firm Size and Export Intensity". *Journal of International Business Studies*, vol. 23(4), pp. 605-635, 1992.
- [15] W. Wagner. "Exports, Firm size, and Firm Dynamics". *Small Business Economics*, vol. 7(1), pp. 29-39, 1995.
- [16] P.J. Loueter, C. Ouwerkerk and B.A. Bakker. "An Inquiry into Successful Exporting". *European Journal of Marketing*, vol. 25(6), pp. 55-57, 1991.
- [17] A.O. Cass, and C. Julian. "Examining firm and environmental influences on export marketing mix strategy and export performance of Australian exporters". *European Journal of Marketing*, vol. 37(3), pp. 366-384, 2003.
- [18] L.F. Lages, and T.C. Melewar. "An exploratory study of Portuguese exporters marketing strategies". *European Marketing Academy*, Rotterdam, 2000.
- [19] P.L. Stump, G.A. Athaide and C. Axinn. "The Contingent Effect of the Dimensions of Export Commitment on Export Financial Performance: An Empirical Examination". *Journal of Global Marketing*, vol. 12(1), pp. 7-25, 1998.
- [20] R.F. Rich. "Knowledge creation, diffusion, and utilization perspectives of the founding editor of knowledge". *Science Communication*, vol. 12(3), pp. 319-337, 1991.

- [21] E. Beleska-Spasova, and K.W. Glaister. "The role of firm-specific advantages in UK export initiation". *Multinational Business Review*, vol. 19(2), pp.168–194, 2011.
- [22] D.F. Spulber. "Global competitive strategy". New York: Cambridge university press, 2007.
- [23] L. Ling-yee. "An examination of the foreign market knowledge of exporting firms based in the People's Republic of China: Its determinants and effect on export intensity". *Industrial Marketing Management*, vol. 33(7), pp. 561–572, 2004.
- [24] L.C. Leonidou. "Empirical research on export barriers: review, assessment, and synthesis". *Journal of International Marketing*, vol. 3, pp. 29-43, 1995.
- [25] A.E. Roberto. "Sources of export success in small- and medium-sized enterprises : the impact of public programs". *International Business Review*, vol. 13, pp. 383–400, 2004.
- [26] B. Stottinger, and H.H. Holzmuller. "Cross-national stability of an export performance model—a comparative study of Austria and the US". *Manage Int Rev*, vol. 41(1), pp. 7 – 28, 2001.
- [27] L.C. Leonidou, C.S. Katsikeas and S. Samiee. "Marketing strategy determinants of export performance : a meta-analysis". *Journal of Business Research*, vol. 55(1), pp. 517–567, 2002.
- [28] L.F. Lages and D.B. Montgomery. "Export performance as an antecedent of export commitment and marketing strategy adaptation: Evidence from small to medium sized exporters". *European Journal of Marketing*, vol. 38(9), pp. 1186–1214, 2004.
- [29] G.O. Ogunmokun, and J. Wong. "Determinants of marketing adaptation/globalization practices of Australian exporting firms". *World Review of Science, Technology and Sustainable Development*, vol. 1(1), pp. 81-92, 2004.
- [30] M.V. Dijk. "The determinants of export performance in developing countries: The case of Indonesian Manufacturing". Eindhoven Centre for Innovation Studies, Eindhoven, The Netherlands, Working paper, 02.01. 2002.

Customer Perceptions and Expectations Regarding Service Qualities in Govt. Owned Commercial Banks of Chittagong City- A Study on Janata Bank Limited, Bangladesh.

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Abstract

The purpose of this article is to find out the customer perceptions and expectations regarding service qualities in the Govt. owned commercial banks of Bangladesh. The average experience with the bank of customer is between 5 to 9 years that indicate their capability to understand and evaluate the services of the bank. From the descriptive analysis we found that almost all the customers are dissatisfied with the perception level in all dimensions of service quality. But from the mentioned service dimensions resulting in expectations are Assurance (mean score 3.56) and Responsiveness (mean score 3.68), that the customers expect more service standards from the bank which indicate more courtesy, ability of employees inspire trust & confidence of the customer and their willingness to help & provide prompt services. Customers want little bit moderation in Empathy (mean score 3.44), that they need few more in caring and individualized attention from the bank. On the basis of age group, almost all the age group is dissatisfied with the services that are currently served by the bank. In Expectation level, the young age group of 20-29 years and 30-39 years expect more service standards than from other age group. Paired sample test shows a significant difference between customer perceptions and the customer expectations regarding Assurance, Empathy, Tangibility and Responsiveness but no significant difference in Reliability.

Keywords: Customer Perception, Customer Expectation, Service Quality, Customer Satisfaction, Banking Service.

1. INTRODUCTION

Service quality is determined by the differences between customer's expectations regarding service they want from the service provider and the services they received from the respective provider. The association between service quality and customer satisfaction has emerged as a topic of significant and strategic concern (e.g. Bolton and Drew, 1991; Cronin and Taylor, 1992). In general, research in this area suggests that service quality is an important indicator of customer satisfaction. Service quality is also attractive to retail banks as a competitive differentiator (Newman, 2001).

The economic share of services currently accounts for more than half the sum of all GNPs worldwide (Akan, 2005). In today's market place, many service companies need to mobilize their internal energies in order to meet the challenges of a changing environment. One of these challenges includes customer's demands as the quality of service improves (Wong and Sohal, 2002).

Service quality is increasingly becoming a major strategic variable (Robledo, 2001; Terziovski and Dean, 1998). And this construct has received increased scrutiny during the last few decades (Svensson, 2004).

In the 1980, large organizations became more interested in the development of service quality measures (Dedeke, 2003). Much of the research has focused on measuring service quality using the SERVQUAL instrument (Kang, 2006; Ladhair, 2008).

While, the SERVQUAL technique has attracted a lot of attention for its conceptualization of quality measurement issues, it has also attracted criticism (O'Neill et al., 1998). One criticism of SERVQUAL has been the point that the instrument mainly focuses on the service delivery process.

This article aims to identify various service quality dimensions proposed and practiced by various researchers and professionals to identify the customers perception and expectation regarding services quality in the banking sectors.

2. LITERATURE REVIEW

At the heart of customer relationship marketing is the quality of customer service, where quality is no longer considered as a separate discipline but as the central part of service and relationship marketing. According to Berry, Parasuraman and Zeithaml (1988) service quality has become a significant differentiator and is the most powerful competitive weapon which a service organization could and should possess. Today the use of loyalty programs as a technique for firms to enhance customer loyalty is extremely popular and has grown exponentially across the world, especially in the United States of America and the United Kingdom (Bellizi & Bristol, 2004), as it is believed that both consumers and firms can gain benefits from it. Moreover, customers' perceptions of employees, particularly perceptions of how the banking staff engage in the program or enhances the operation of the program would seem likely to affect the motivation to participate.

Researchers have tried to develop conceptual models to explain the service quality and to measure consumers perceived service quality in different industries (Seth et al., 2005).

A good operational example of a standardized framework for understanding service quality is the SERVQUAL instrument developed by Parasuraman. The researchers discovered five general dimensions with focus group interviews which they labeled: reliability, responsiveness, tangibles, assurance and empathy (Wong and Sohal, 2002).

Service quality is an important factor for success in the banking sector. Thus, some bank managers emphasize the various dimensions of service quality (Glaveli et al., 2006).

Bahia and Nantel consequently developed a specific new scale for perceived service quality in retail banking. This Bank Service Quality (BSQ) model is an extension of the original 10 dimensions of the model of Parasuraman. In addition, Bahia and Nantel incorporated additional items such as courtesy and access, as proposed by Carman and items representing the marketing mix of the 7Ps (product/service, place, process, participants, physical surroundings, price and promotion) from the Boom and Bitner framework (Petridou et al., 2007).

Aldlaigan and Buttle have developed and validated a new 21 item scale that describes customer's service quality perceptions comprising four dimensions: service system quality, behavioral service quality, service transactional accuracy and machine service quality (Petridou et al., 2007).

In response to this, as well as the importance of service quality in a banking industry, this article aims to fill the gap by examining the possible dimensions of service quality that are vital to customers. This article highlights several dimensions of service quality that assesses the customer satisfaction regarding their perception and expectation.

3. OBJECTIVES

The main objective of this study is to analyze the customer perceptions and expectations regarding service qualities in Govt. owned commercial banks of Bangladesh. Specifically the objectives can be recognized as:

- ✓ To find out the customers' satisfaction regarding service qualities offered by the bank.
- ✓ To find out service perceptions and expectations on the basis of age group.
- ✓ To find out the gap between customer perceptions and customer expectations regarding services delivered by the bank.

4. METHODOLOGY

The research is mainly based on the survey through questionnaire. We have taken Janata Bank Limited as a sample bank and the survey was conducted over 75 customers from the different branches in Chittagong city, Bangladesh through cluster sampling to analyze their perception and expectation regarding service quality they are facing. Data were collected by the post-graduate marketing students in the month of October and November, 2012 by visiting the branches personally and contacting the customers.

Parasuraman et al. (1985) has built up service quality scale comprising 10 dimensions (reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer and tangibles). Subsequent work by Parasuraman et al. (1988) resulted in the service quality measurement scale with 5 dimensions. The dimensions reliability, responsiveness and tangibles were retained as identified in 1985 whereas communication, competence, credibility, courtesy and security merged as a new dimension "assurance". Access and understanding / knowing the customer merged to form the dimension "empathy".

Thus the five dimensions of service process qualities were used in this study to determine customer perceptions and expectations and the dimensions are Assurance (Competence, Courtesy, Credibility, and Security), Empathy (Access, Communication, Knowing the customer), Tangibility, Reliability and Responsiveness.

The questionnaire consisted of 30 constructs to know the customer perceptions where three questions are for each of the determinants (Competence, Courtesy, Credibility, Security, Access, Communication, Knowing the customer, Tangibles, Reliability and Responsiveness) and 5 questions are set to determine customer expectation where single question is for each of the five determinants (Assurance, Empathy, Tangibles, Reliability and Responsiveness).

The study has launched with the following hypothesis.

Hypothesis 1: There is no significant difference between the customer perceptions and the customer expectations regarding Assurance.

Hypothesis 2: There is no significant difference between the customer perceptions and the customer expectations regarding Empathy.

Hypothesis 3: There is no significant difference between the customer perceptions and the customer expectations regarding Tangibility.

Hypothesis 4: There is no significant difference between the customer perceptions and the customer expectations regarding Reliability.

Hypothesis 5: There is no significant difference between the customer perceptions and the customer expectations regarding Responsiveness.

The customers were asked to fill in a structured questionnaire by indicating their degree of agreement on a five-point Likert scale (strongly agree to strongly disagree). Here we assume 1=20 to 29 years, 2=30 to 39 years; 3=40 to 49 years, 4=50 years & more in the respect of respondent age; 1=0 to 4 years, 2=5 to 9 years, 3=10 to 14 years, 4=15 to 19 years, 5=20 years & more in the respect of respondent experiences with the bank; and 1=strongly disagree, 2=disagree, 3=no comment/neutral, 4=agree, 5=strongly agree in the respect of perceptions and in expectations 1=customer have very low expectation to 5 = customer have very high expectation in all service quality dimension. Here we summarize the value of Competence, Courtesy, Credibility & Security as Assurance; and Access, Communication, Knowing the customer as Empathy in all the analysis.

The selected determinants of service quality by Parasuraman et al., 1988 which has been formulated to survey the customers were defined as: -

Assurance - Knowledge and courtesy of employees and their ability to inspire trust and confidence.

- i. Competence – means possession of the required skills and knowledge to perform the service.
- ii. Courtesy- involves politeness, respect, consideration, and friendliness of contact personnel (including receptionists, telephone operators, etc.).
- iii. Credibility- involves trustworthiness, believability, honesty. It involves having the customer's best interests at heart.
- iv. Security- the freedom from danger, risk, or doubt.

Empathy - Caring, individualized attention the firm provides its customers.

- i. Access – involves approachability and ease of contact.
- ii. Communication - means keeping customers informed in language they can understand and listening to them. It may mean that the company has to adjust its language for different customers—increasing the level of sophistication with a well-educated customer and speaking simply and plainly with a novice.
- iii. Knowing the customer- involves making the effort to understand the customer's needs.

Tangibles - Appearance of physical facilities, equipment, personnel, and communication materials.

Reliability - Ability to perform the promised service dependably and accurately.

Responsiveness - Willingness to help customers and provide prompt service.

5. FINDINGS AND ANALYSIS

5.1 Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Age of the Respondents	75	1.00	4.00	2.3600	1.03602
Experience with the Bank	75	1.00	5.00	2.4800	1.50333
Perception on Assurance	75	1.00	4.00	2.5600	.65064
Perception on Empathy	75	1.00	4.00	2.6000	.70711
Perception on Tangibility	75	2.00	4.00	2.7200	.61373
Perception on Reliability	75	2.00	5.00	2.8000	.64550
Perception on Responsiveness	75	1.00	3.00	2.4400	.58310
Expectation in Assurance	75	3.00	5.00	3.5600	.58310
Expectation in Empathy	75	3.00	4.00	3.4400	.50662
Expectation in Tangibility	75	1.00	4.00	3.1600	.80000
Expectation in Reliability	75	2.00	4.00	3.1200	.78102
Expectation in Responsiveness	75	3.00	4.00	3.6800	.47610
Valid N (list wise)	75				

TABLE 1: Descriptive Statistics.

From the above table we see the average experience with the bank of customer is between 5 to 9 years that means they are capable enough to understand and evaluate the services that the bank is currently serving. From the descriptive analysis of customer perceptions, we see that customers has no satisfaction or dissatisfaction regarding their perceptions towards the Assurance (mean=2.56), Empathy (mean=2.60), Tangibility (mean= 2.72), and Reliability (mean= 2.80) of the bank. But the customers are dissatisfied with the perception level in Responsiveness (mean=2.44) of the bank.

From the descriptive analysis of customer Expectations, we see that customers want more service standard in the sector of Assurance (mean=3.56) and Responsiveness (mean=3.68) of the bank which indicate more courtesy, ability of employees inspire trust & confidence of the customer and their willingness to help customers & to provide prompt services. Customers want little bit moderation in Empathy (mean=3.44) that means the bank need few more in caring and give individualized attention of its customers. Customers shows no satisfaction or dissatisfaction in the expectation level of Tangibility (mean=3.16) that indicate the appearances of physical facilities, equipment, personnel, communication materials and Reliability (mean=3.12) that the ability to perform the promised service dependably & accurately.

5.2 Service perceptions and expectations on the basis of age group

Age Group	20-29 years			30-39 years			40-49 years			50 years & more		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Perception on Assurance	21	2.28	.487	15	2.40	.547	30	3.00	.471	09	2.00	1.00
Perception on Empathy	21	2.42	.534	15	3.00	.000	30	2.80	.788	09	1.67	.577
Perception on Tangibility	21	2.57	.534	15	3.20	.447	30	2.70	.674	09	2.33	.577
Perception on Reliability	21	2.71	.487	15	3.40	.894	30	2.70	.483	09	2.33	.577
Perception on Responsiveness	21	2.57	.534	15	2.20	.836	30	2.60	.516	09	2.00	.000
Expectation in Assurance	21	3.86	.690	15	3.60	.547	30	3.30	.483	09	3.66	.577
Expectation in Empathy	21	3.71	.487	15	3.60	.547	30	3.20	.421	09	3.33	.577
Expectation in Tangibility	21	3.14	.899	15	3.40	.547	30	3.00	.942	09	3.33	.577
Expectation in Reliability	21	3.28	.951	15	3.40	.547	30	2.90	.737	09	3.00	1.00
Expectation in Responsiveness	21	3.86	.377	15	3.60	.547	30	3.60	.516	09	3.66	.577

TABLE 2: Service Perceptions and Expectations on the Basis of Age Group.

From the analysis we find that, almost all the age group is dissatisfied with the services that are currently served by the bank. In Expectation level, the young age group of 20-29 years and 30-39 years expect more service standards from the bank than from other age group.

5.3 Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Perception on Assurance - Expectation in Assurance	1.00000	.86603	.17321	.64252	1.35748	5.774	74	.000
Pair 2	Perception on Empathy - Expectation in Empathy	.84000	.89815	.17963	.46926	1.21074	4.676	74	.000
Pair 3	Perception on Tangibility - Expectation in Tangibility	.44000	.86987	.17397	.08094	.79906	2.529	74	.018
Pair 4	Perception on Reliability - Expectation in Reliability	.32000	.90000	.18000	-	.69150	1.778	74	.088
Pair 5	Perception on Responsiveness - Expectation in Responsiveness	1.24000	.83066	.16613	.89712	1.58288	7.464	74	.000

TABLE 3: Paired Samples Test.

From the above table we see that, there is a significant difference between customer perceptions and the customer expectations regarding Assurance, Empathy, Tangibility and Responsiveness; thus **Hypothesis 1, Hypothesis 2, Hypothesis 3** and **Hypothesis 5** get rejected. But there is no significant difference between the customer perceptions and the customer expectations regarding Reliability and the **Hypothesis 4** get accepted.

6. CONCLUSION

The study analyzes the customer perceptions and expectations regarding service qualities in Govt. owned commercial banks of Bangladesh. From the descriptive analysis we see that maximum customer is dissatisfied with the perception level in all dimensions of service quality. On the other hand, in expectation level, customers expect more in Assurance, Responsiveness and Empathy. On the basis of age group, almost all the age group is dissatisfied with the services that are currently served by the bank but in the expectation level, the young age group of 20-29 years and 30-39 years expect more service standards than from other age groups.

Paired sample test shows a gap between customer perceptions and the customer expectations regarding Assurance, Empathy, Tangibility and Responsiveness but no gap in Reliability. So the bank should concentrate more on to improve service standards in courtesy, ability of employees inspire trust & confidence of the customer, their willingness to help & provide prompt services, need few more in caring and individualized attention to retain and close the gap with the customers. It is, therefore very important to know how customers evaluate service quality and what can be done to measure and improve it.

This study use relatively small sample and being restricted within the Chittagong City of Bangladesh. Further research in the area of service quality under such circumstances would soon

be in great demand and would be contributing to the Govt. owned commercial banking sectors in Bangladesh.

7. REFERENCES

1. P. Akan. (2005). Dimensions of service quality: A study in Istanbul. *Managing Service Quality*, Vol. 5, pp.39-43.
2. M. Alamgir and M. Shamsuddoha. Service. (2003, June 1). Quality Dimensions: A Conceptual Analysis. *The Chittagong University Journal of Business Administration*, Vol. 19.
3. JA. Bellizi and T. Bristol. (2004, November 2). An assessment of supermarket loyalty cards in one major US market. *Journal of Consumer Marketing*, Vol. 21(2), pp.144-154.
4. L. Berry, A. Parasuraman and V. Zeithaml. (1988, September-October). The service-quality puzzle. *Business Horizons*, Vol.31(5), pp. 35.
5. R.N. Bolton and J.H. Drew. (1991, January), "A longitudinal analysis of the impact of service changes on customer attitudes", *Journal of Marketing*, Vol. 55, pp. 1-9.
6. J.J. Cronin and S.A. Taylor. (1992, July), "Measuring service quality: a re-examination and extension", *Journal of Marketing*, Vol.56, pp.55-68.
7. A. Dedek. (2003). Service quality: A fulfillment-oriented and interactions-centered approach. *Managing Service Quality*, Vol.13, pp.276-289.
8. N. Glaveli, E. Petridou, C. Liassides and C. Spathis, (2006). Bank service quality: Evidence from five balkan countries. *Managing Service Quality*, Vol.16. pp.380-394
9. H. Emari, S. Iranzadeh and S. Bakhshayesh. (2011). Determining the Dimensions of Service Quality in Banking Industry: Examining the Gronroos's Model in Iran. *Trends in Applied Sciences Research*, Vol.6: pp.57-64.
10. G.D. Kang. (2006). The hierarchical structure service quality: Integration of technical and functional quality. *Managing Service Quality*, Vol. 16: pp.37-56.
11. R. Ladhair. (2008). Alternative measures of service quality: A review. *Managing Service Quality*, Vol. 18:pp. 65-86.
12. K. Newman. (2001), "Interrogating SERVQUAL: a critical assessment of service quality measurement in a high street retail bank", *The International Journal of Bank Marketing*, Vol. 19 (3), 126-139
13. N.A Omar, M. Azrin and H. Sarah. (2009, January) "What customers really want: Exploring service quality dimensions in a retail loyalty", *UNITAR E-JOURNAL*, Vol. 5, No. 1.
14. M.A. O'Neill, A.J. Palmer and R. Beggs, (1998). The effects of survey timing on perceptions of service quality. *Managing Service Quality*, Vol. 8: pp.126-132.
15. E. Petridou, C. Spathis, N. Glaveli and C. Liassides, (2007). Bank service quality: Empirical evidence from Greek and Bulgarian retail customers. *Int. J. Quality Reliability Manage.* Vol. 36: pp.907-918.
16. M.A. Robledo. (2001). Measuring and managing service quality: Integrating customer expectations. *Managing Service Quality*, Vol.11: pp.22-31.

17. N. Seth, S.G. Deshmukh and P. Vrat, (2005). Service quality models: A review. *Int. J. Quality Reliability Manage.* Vol. 22: pp.913-949.
18. G. Svensson.(2004). Interactive service quality in service encounters: Empirical illustration and models. *Managing Service Quality*, Vol. 14: pp.278-287.
19. M. Terziovski and A. Dean. (1998). Best predictors of quality performance in Australian service organization. *Managing Service Quality*, Vol. 8: pp.359-366.
20. A. Wong and A. Sohal, (2002). Customers perspectives on service quality and relationship quality in retail encounters. *Managing Service Quality*, Vol.12: pp.424-433.

Spontaneous Congestion Process in Inter-bank Payment System

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Abstract

With the highly development of information technology, the more efficient inter-bank payment system is required by modern financial system. This paper analyzes the spontaneous process of congestion in inter-bank payment system through creating multi-agents model between banks and customers. The simulation result indicates that the systemic liquidity congestion of inter-bank payment system is affected seriously by the demand of inter-bank payment. We find that the scale of bank system plays an important role on relieving the systemic payment pressure. On the other hand, the scale of bank system has a positive relationship with the probability of payment crisis occurrence, because the larger scale of the bank, the more pressure it takes in payment system.

Keywords: Swarm Intelligence, Systemic Congestion, Payment Crisis, Non-homogeneous Poisson Process.

1. INTRODUCTION

The rapid development of modern economy depends heavily on the reliable and high-efficiency financial market. The sustained advancement of information technology undoubtedly becomes a catalyst for the accelerated expansion of financial industry. It forms a complex network structure among financial institutions and the other market participants. In this structure, one core infrastructure is the interbank payment system which allows movement of funds between banks. Fund transfers may be related to transactions originating from money, foreign exchange or securities markets.

The financial regulatory agencies from almost all countries focus on internal liquidity of entire financial system. The U.S. subprime crisis which leads to the great recession in 2008 reminds the whole world of the significance of maintaining adequate liquidity. However, it is not enough for the transactions only assisted by efficient computers. To the banks, there are different total payment requests from their customers in the same period. If some bank or part of banks cannot satisfy

customers' payment requests for shortage of liquidity, the payment system is hard to avoid accumulating unpaid orders which causes the decline of the liquidity of financial system eventually. Thereby financial difficulties or financial institutions' bankruptcy is very likely to happen among the other market participants through financial contagion, due to their capital chain rupture affected by those banks lacking liquidity, which will bring huge losses to the real economy. Trading payments' settlement instantly plays an important role in insuring the stability of financial market; however, the phenomenon of payment orders delaying occurs in both developed countries and developing countries. Therefore, it is great practical significance of preventing the emergence of systemic crisis and keeping financial system stable and healthy through studying how to avoid systemic congestion (payment orders delayed aggregating) occurring in the payment system.

2. BACKGROUND

At present, the financial market is a complicated system consisted of various functional organizations and entities. Most of participants in market settle the trade through interbank transfer, thus interbank payment system undoubtedly becomes the most important part of whole financial system. Furthermore, interbank payment system is the trading center of currency market, such as foreign exchange market and stock market. Today, the total payment requests processed by FFS (Fedwire Funds Service) in United States are more than 500,000 in one day, and the amount value is over 2 trillion dollars [1]. The TARGET system in EU has the similar function as FFS in U.S. [2].

In China, with the establishment of interbank payment system, our payment system has transformed from a measurement tool for recording the planned economic activities into a tool for helping banks to adapt for the development of market economy. In 2010, China Union Pay interbank information exchange system processed successfully transactions 8.453 trillion and the total transaction value is 11.23 trillion yuan, with a growth of 21.77% and 46.40% individually, and the ratio of successful transactions is 98.5% in 345 out of 365 days in one year [3]. According to the data, the economy of China works well with relatively high transaction success rate in payment system. However, the higher transaction success rate is, the harder latent problems are found, so congestion phenomenon in payment system is easily ignored by financial regulatory bureaus in those countries which is rarely in a payment crisis.

In fact, currently several experts have doubted about the safety of payment system. Participants of payment system have an economic incentive to minimize the funds committed to payment processing because liquidity used for settling payments imposes an opportunity cost on banks. Shortfalls of funds can delay a bank's payment processing, and payment systems can even enter gridlock states in which no bank can process a payment. Delayed payments are unavailable to intended recipients: in this way congestion in the payment system can propagate into the economy by restricting money flow among banks and eventually among their customers. Morten and Soramäki [4] pointed out in Annual Report of the ECB TARGET run (2006), there probably will be a large number of unpaid payment requests accumulated due to the shortage of liquidity of some banks in inter-bank payment system, and eventually make the liquidity of entire payment system decline, risk aggregates continuously, even part of banks have to delay the payment orders or go bankruptcy. For the complexity of payment system itself, most of researches on liquidity risk's formation resort to the simulation method [5]. These simulations have used detailed descriptions of the business rules followed by the diverse participants, including banks and system operators, to anticipate the response of specific systems to potential stresses. The study of Beyeler et al(2006) is representative of simulation methods[6]. Their conclusion showed that there would be numbers of unpaid payment instructions aggregated because of lacking external liquidity market for adjusting the liquidity. This phenomenon was called "Systemic Congestion". For assumptions on the fixed network structure and homogenous banks and customers, Beyeler's model is incompatible with reality. Soramäki [7] firstly used the network method for describing the complex structure of the bank payment system, which edges are links between banks formed by payment relationships. Factually, even the main structural feature of the real

interbank payment system is scale-free topology [8], however, the structure of the interbank payment relationships vary dynamically with payment flows' changing over time. In this case, Beyeler's model is not very reasonable. Accordingly, Beyeler's research merely proved the existence of the "crowding" from the result, and barely explained the mechanism of "spontaneity" of systemic congestion phenomenon.

In addition, ABM (Agent-based Model) method is playing an important role in studying laws of complex system from bottom to up, since Bak [9] et al found that there would exist self-organization phenomenon in a nonlinear dynamical system formed by a large number of interacting agents. This paper builds an interbank payment system model based on swarm intelligence model, and then studies the emergence of systemic congestion and the main factors influencing the formation process of settlement system crowding phenomenon in a nonlinear dynamical system which is composed by banks, banks' clients (customers) and settlement center of the central bank in simulation. At last, some policy recommendations are proposed for keeping interbank settlement system stable operation in China, even other countries in the world.

3. MODEL

3.1 Environment Settings

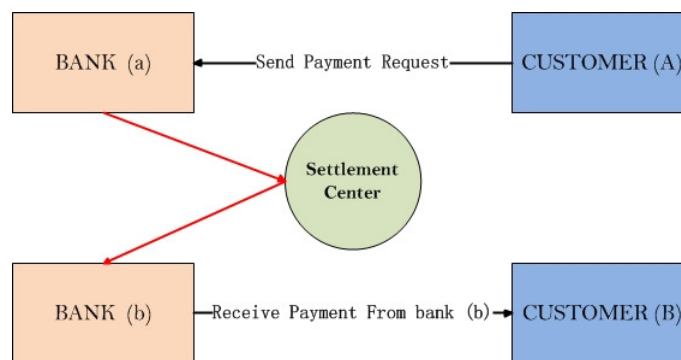


FIGURE 1: Payment Request Flow Chart.

The whole simulation system is constituted by the bank group (banks), the settlement center of central bank, customer group (customers), including financial and non-financial enterprises, individuals, and other entities.

Trading behaviors in the market usually are caused by a variety of real economic activities among agents in customer group. The liquidation of these transactions, except for little amount of cash transactions, are usually completing through the bank's payment function. As shown in Figure 1, some transaction happens between customer (A) and (B) for some real trade, customer (A) has to pay agent (B) for traded goods or other things. If the transaction is a non-cash transaction, customer (A) need to send a payment instruction to bank (a), in which it has a deposit account. Bank (a) transfers the money to the bank (b) by the payment system of settlement center in central bank after receiving the instruction, if the surplus account balance of Bank(a) is of sufficient for paying. At last, bank (b) notifies the agent (B) to complete payment receiving.

To analyze the function of interbank payment system, firstly we must analyze the characteristics of commercial banks' accounts in the central bank. For example, In China, the commercial banks must register three accounts in local branches of the People's Bank of China: Reserve Account, Surplus Reserve Account, and the Loan Account. Reserve Account exists for the statutory reserve requirements so that the account balance are the sequestration of funds which can not be used, however, it usually makes corresponding adjustment based on the amount of deposits in

a period. Loan account is the lending limits that commercial banks can borrow from the central bank, the credit scale will be distributed regionally and institutionally after being enacted by the head office of the central bank and commercial banks. The financial settlement of transactions payments are executed through the funds transfer among the commercial banks' surplus reserve accounts in the central bank's payment system. Although the surplus deposits obtain the interest income from central bank, the interest rate is lower than market interest rate, thus the banks will only retain a small proportion of their deposits as surplus to deal with the random payment requests in order to reduce the opportunity cost.

As shown in Figure 2, at time t , bank i receive a payment instruction $I_i(t)$ sent by one of its customers, if its surplus account balance $B_i(t)$ satisfies the constraint $B_i(t) \geq I_i(t)$, then transaction amount will directly transfer through payment system; if surplus account balance is not enough to pay, bank i can only pay $B_i(t)$, the unpaid part will enter the unsettled queue $Q_i(t)$ of bank i which will be settled after other banks' transfer payments to bank i .

In absence of external liquidity financing mechanism, it is very possible to lead $Q_i(t)$ to accumulate. Therefore the payment pressure of the entire banking system would rise continuously. With the formation of systemic liquidity congestion, bank default and bankruptcy are going to happen for lacking of liquidity. This paper analyzes the process of cumulating total balance in unpaid queue $\sum Q_i(t)$ through swarm intelligent model. The larger $\sum Q_i(t)$ is, the higher level of the systemic congestion is.

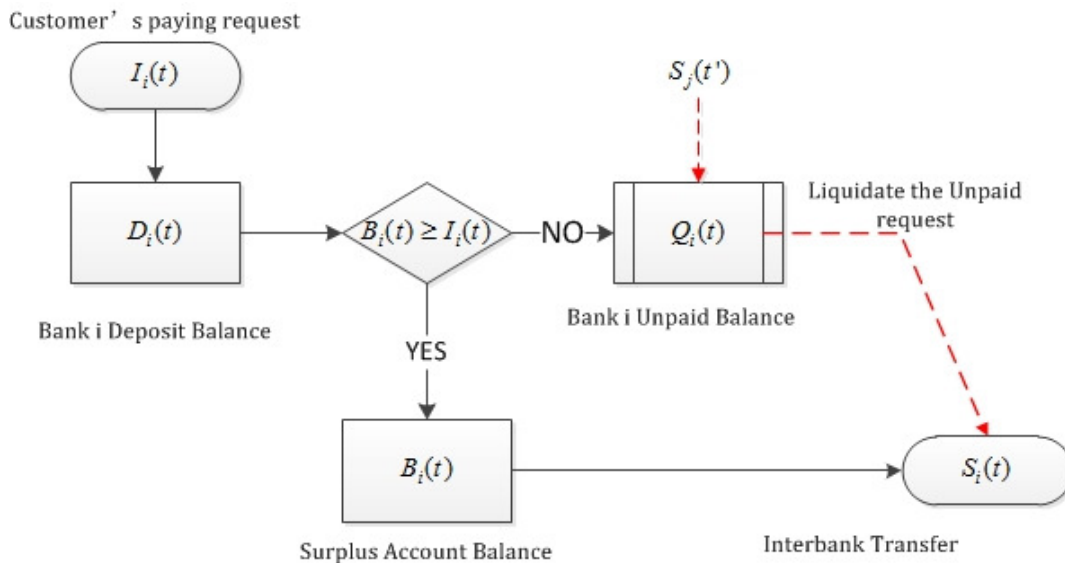


FIGURE 2: Response Process of Bank i after Receiving Payment Instruction $I_i(t)$.

3.2 Bank Group Model

V represents the set of all banks. As equation (1) shows, bank payment process involves three financial status variables, $D_i(t), B_i(t), Q_i(t), i \in V$. As the difference of banks' financial status in reality, we define banks' scales are of heterogeneity, so their initial deposits are different each other. According to the research on the scale of USA corporations by Axtell Robert[10], this model assumes that the initial deposits size of each bank in the bank group obeys Pareto power-law distribution. That is:

$$P(D_i(0) > d) = \begin{cases} (d_m / d)^\alpha & d \geq d_m \\ 1 & d < d_m \end{cases} \quad (1)$$

d_m is the low-limit of bank initial deposits, α is a power-law distribution parameter. Then we assume that k is a fixed ratio of each bank's initial surplus account balance to initial total deposits. Then we have:

$$B_i(0) = k \cdot D_i(0) \quad (2)$$

At the beginning of simulation, all banks have no unpaid payment requests, that is $Q_{i \in V}(0) = 0$.

We use Python to build a bank system project, and the major properties and methods of bank class are as follows (Table 1):

Properties	Methods
Deposit	Send payment request
Balance	Receive payment
Queue	Add unpaid payment part into queue
	Liquidate unpaid payment part in queue

TABLE 1: The Main Properties and Methods of Bank Class in Program.

$S_i(t)$ is the amount of payment that bank i actually transfer through payment system at time t , at the same time, we set payment amount received by bank i from other banks as $R_i(t)$. In continuous time model, bank i 's deposits $D_i(t)$, the total surplus account balance $B_i(t)$ and the total unpaid payments $Q_i(t)$ at time t should satisfy the dynamic constraints (3) (4) (5):

$$D_i(t) = D_i(0) + \int_0^t (R_i(s) - I_i(s)) ds \quad (3)$$

$$B_i(t) = B_i(0) + \int_0^t (R_i(s) - S_i(s)) ds \quad (4)$$

$$Q_i(t) = \int_0^t (I_i(s) - S_i(s)) ds \quad (5)$$

In simulation process, as sending time of each customer's payment order is random and discrete, so the integral of equations (3) (4) (5) can be converted into summation calculation.

3.3 Customer Group Model

In our model, the main behavior of agent in customer group is sending randomly payment instructions to the agent in bank group. Due to the different amount included in each payment instruction in reality, there is no statistical distribution for each payment amount in payment system operation report of Chinese central bank, furthermore, Beyeler et al's equal payment order does not identical to reality, in this article, we assume that $I(t)$ obeys the uniform distribution in the interval $(0, I_{\max}]$.

On the other hand, the deposits size of bank should have positive correlation with the number of payment instructions received in unit time. Therefore this model set each customer's payment order sending as non-homogeneous Poisson process, which means the frequency of customer's payment order per unit time is proportional to bank(order source node)'s current scale of clients' deposits. The strength parameter $\lambda(t)$ of Poisson process satisfies constraint (6).

$$\lambda(t) \propto D_i(t) \quad (6)$$

According to characteristics of Poisson process, in a short period $\Delta t \rightarrow 0$, the probability of one payment order sent from one customer to bank i should be $\lambda(t) \cdot \Delta t$.

3.4 Banks and Customers Interaction Mechanism

The external parameters in our simulation system are total number of banks N , and the number of agents in customer group M . After determining quantity of bank group and customer group, the simulation is carried out according to the following steps:

- 1) In the light of the external parameters settings, bank and customer instances would be created. And then bank instance is initialized in order to make the bank sizes obey power-law distribution.
- 2) Traverse all instances of customer group at current system time, trigger the event of sending payment order, of course, the trigger mechanism should obey non-homogeneous Poisson process, and then we can determine whether each agent send a payment order currently and the payment amount of this order.
- 3) The bank instance designated to participate in the payment triggers the payment sending events. If the surplus reserve account balance is not sufficient, it covers partial payment request, and then triggers the event that unpaid part is added into the queue of due payments. In this process, it executes liquidation due payment event immediately once the bank receives the interbank transfer from other banks. Refer to some banks, sending and receiving events will recursive call several times. Of course, it is possible that one bank only deals transfer payments to another bank or receives transfer payments from some banks at the current time. These random situations are influenced by the instructions' randomly arriving in step (2).
- 4) Calculate current total unpaid payment requests of banks in simulating system, and then return to step (2). The simulation will continue until time is beyond the presetting total system time.

4. SIMULATION RESULTS

We use Python programming language to model the entire simulation system, and analyze the results in two aspects. On the one hand we observe the formation of systemic congestion, and find factors affecting the level of congestion. On the other hand, we can find the relative possibility of payment crisis for different banks, according to different banks final financial status when simulation ends.

4.1 Congestion of the Payment System

Firstly, we fix the total number of banks $N = 20$, and then change the number of customers, separately set $M = 100, 500, 1000$ to obtain the results in Figure 3.

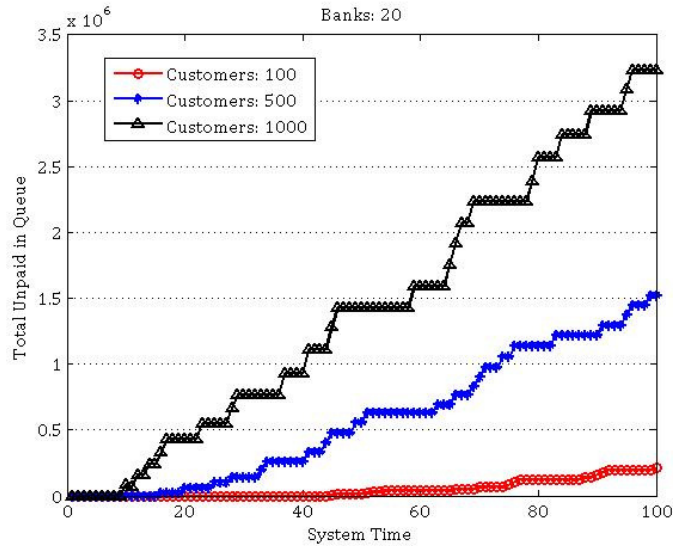


FIGURE 3: Customers Scale's Influence on The Level of Congestion.

In Figure 3, the curve with 1000 agents (customers) is on the top, and the curve with 100 agents (customers) is at the bottom. It shows that the systemic congestion will be higher with the total number of customers' systemic increasing. Finally, it will lead more rapidly aggregation of the unpaid payments.

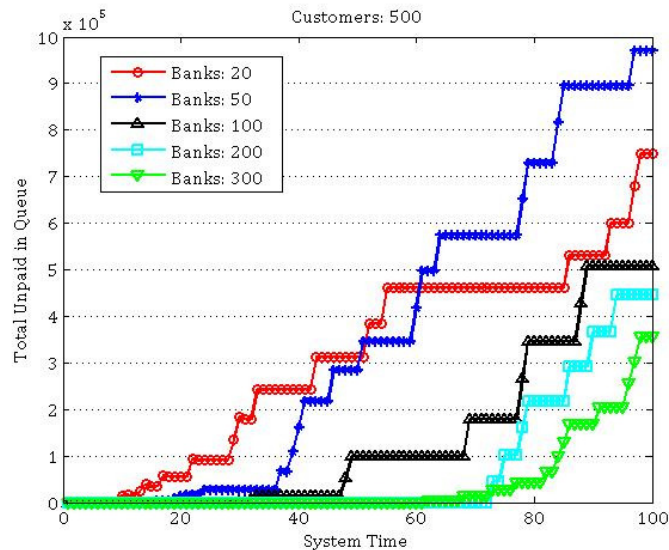


FIGURE 4: Banks Scale's Influence on The Level of Congestion.

The huger customers' scale inside simulation system is, the more payment orders sent in every time period, in other words, paying pressure for banks is proportional to the customers' scale.

In addition, the total number of customers is fixed as $M = 500$, and then we change the number of banks, $N = 20, 50, 100, 200, 300$, the result is shown in Figure 4.

As Figure 4 shows, the delayed paying requests will accumulate relatively slowly when the scale of banks in system expands. The reason is that more banks undertake the payment pressure, in

this case, the probability of congestion in payment system will decrease with payment pressure's easing.

4.2 Payment Crisis Analysis

We get the values on financial status of the banks using numerical analysis at the end of the system simulation.

Bank ID	D_i	B_i	Q_i	Status
1	216566.94	919.69	315736.85	1
2	128503.96	37567.87	0.00	0
3	173718.16	0.00	255249.97	1
4	130199.32	17490.92	0.00	0
5	270273.71	0.00	601718.30	1
...

TABLE 2: Part of Values of Individual Financial State Variables in Bank Groups at the End of Simulation.

Table 2 shows financial status of banks at the end of simulation. The bank i can be defined “payment crisis occurrence”, if the bank i 's deposits balance D_i is less than unpaid Q_i . The bank needs to increase liquidity urgently, or it will have risk of default or go bankruptcy. We mark the banks which face liquidity problem with label 1, the other banks without payment crisis are labeled 0.

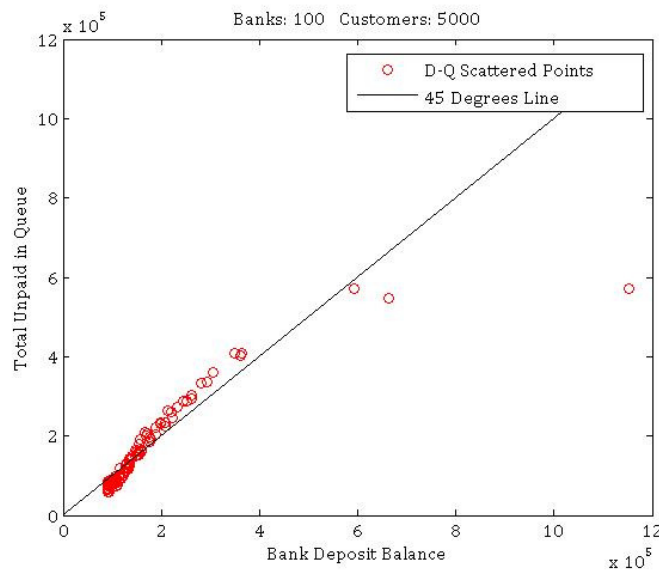


FIGURE 5: The Final Status about Bank Deposit and Unpaid Balance (100 Banks, 5000 Customers).

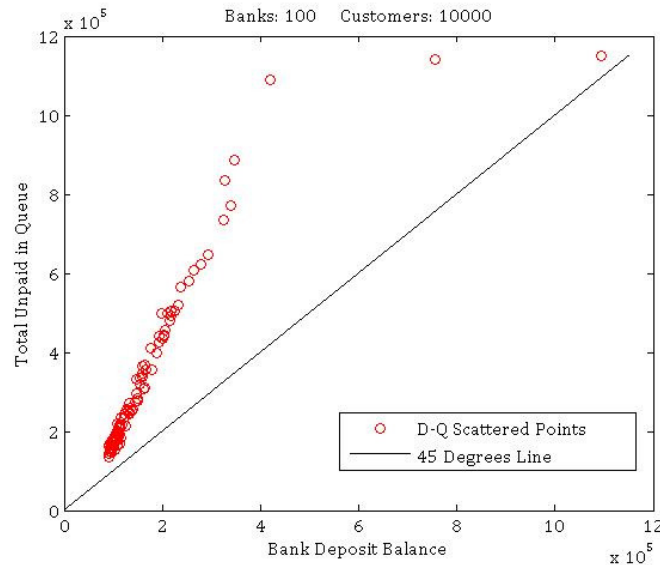


FIGURE 6: The Final Status about Bank Deposit and Unpaid Balance (100 Banks, 10000 Customers).

We run the simulation system on condition that the total number of banks is $N = 10^2$, the customers' scale is $M = 5000, 10000$. Part of data (D_i, Q_i) is shown in Table 1, and Figure 5 and Figure 6 are the scatter-plot graphs including all data.

Figure 5 indicates that the more deposits bank takes, the more unpaid balance is accumulated probably. However, the trend slows down gradually with the bank deposit balance increasing. The straight line in Figure 5 and Figure 6 is the point set $P (P = \{(D_i, Q_i) | D_i = Q_i\})$. Those points above the line satisfy the constraint $D_i < Q_i$, and it means those banks face payment crisis. And those points under the line satisfy the constraint $D_i > Q_i$, and it indicates those banks' financial status is safe. Obviously, in modern payment system, the medium-sized bank takes relatively more pressure, Both Figure 5 and Figure 6 show the curve, which consist of D-Q scattered points, is concave. Two reasons lead this result: on the one hand, the small banks is relatively safe for its smaller customer deposit scale, so they undertake light payment pressure. On the other hand, the large banks can maintain their financial status well, because their asset scale is relative large, which leads them to buffer more payment pressure.

5. CONCLUSION

The inter-bank payment system is the core of modern financial system, and it is an important tool for detecting the market liquidity. Appearance of "congestion" inside the inter-bank payment system is bound to lead to decrease the liquidity of entire market, hinder economic development, and even give rise to serious payment crisis to part of banks.

In this paper, simulation results mainly indicate that: 1) the formation speed of congestion phenomenon is severely influenced by the market payment demand. The total amount of unpaid requests will increase rapidly, when systemic payment pressure rises constantly. At present, Chinese economy is developing prosperously and the payment system in central bank is in the period of constructing and improving. With economic developing, liquidity for trading boost quickly, thus, the contradiction formed between payment pressure growing and paying settlement system's not well developed. 2) The total number of banks plays an important role on alleviating congestion phenomenon, therefore, the authorities can release the pressure in paying demand

through establishing more banks to provide financial services. 3) Otherwise, we find that the medium-sized banks have the relatively greater payment pressure through analyzing the forming of bank payment crisis. Therefore the regulatory sectors need to more carefully monitor the liquidity index of medium-sized banks and suggest them to replenish liquidity timely so as to prevent excessive accumulation of payment delayed.

6. FUTURE WORK

This article focuses on the spontaneity of formation process of payment congestion, when there isn't a mechanism for bank system financing external liquidity through inter-bank borrowing. The follow-up research will add the external liquidity market and the central bank into simulation system, then study how to reduce the level of systemic congestion, and estimate the total cost of eliminating systemic congestion.

7. REFERENCES

1. M. Andrews, J. James, M.P. Simon, "Liquidity Effects of the Events of September 11, 2000." Federal Reserve Bank of New York Economic Policy Review, vol. 8, no.2, pp.59-79, 2002.
2. European Central Bank. TARGET annual report 2005. Frankfurt am Main, 2006, pp.1725-4876.
3. The people's bank of China. China payment system development report. Beijing:China financial publishing house, 2010, pp.39-40.
4. B. Morten, K. Soramäki, "Gridlock resolution and bank failures in interbank payment systems." TARGET annual report 2005, pp.149-177, 2006.
5. H. Leinonen, "Liquidity, risks, and speed in payment and settlement systems: a simulation approach." Bank of Finland Studies, 2005.
6. W. E. Beyeler, R. Glass, R. Bech, M. S, K. Soramäki, "Congestion and Cascades in payment systems." Federal Reserve Bank of New York Staff Reports, No.259, 2006.
7. K. Soramäki, K. Morten, L. Arnold, J. Glass, R. Beyeler, "The topology of interbank payment flows." Physica A., vol.379, pp. 317-333, 2007
8. H. Inaoka, T. Ninomiya, K. Taniguchi, T. Shimizu, H. Takayasu, "Fractal Network derived from banking transaction-An analysis of network structures formed by financial institutions." Bank of Japan Working papers, 2004, No. 04-E-04.
9. P. Bak., C. Tang, K. Wiesenfeld, "Self-organized criticality: an explanation of 1/f noise." Physical Review Letters, vol.59, pp.381-384, 1987.
10. R. Axtell, "Zipf distribution of U.S. firm sizes." Science, vol.293, pp.1818-1820, 2001.

A Study on The Freelancing Remote Job Websites

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Abstract

Since mid-nineties began a new dawn in employment avenues by the arrival of low cost Internet broadband technologies and enterprise capabilities of highly powerful yet cheaper computers, this gave birth to a new virtual job model called as “Remote work”, “Hiring on Demand” or “Crowd sourcing”. A number of companies have mushroomed under the umbrella of Remote Work model. They pay handsome wages to the Job Seekers both matured as well as novice at ease. The jobs are advertised and bidding is done by the job seekers to procure the work (project), job seekers bid based on their talent. Job provider has the prerogative to select the appropriate job seeker by interviewing the bidders and getting the right worker for the right price. This paper discusses about the companies who bring job seeker and job provider together through the medium of internet and binding them in a virtual office. The online remote job sites look after their work reporting, billing computation and compensation of the wages.

Keywords: Remote Work, Hiring On Demand, Crowd Sourcing, Job Seeker, Job Provider.

1. INTRODUCTION

Online freelance marketplaces are websites that match buyers of electronically deliverable services. Technological innovations such as electronic deliverability of jobs and fast Internet connections have increased the supply of remote jobs that can be performed by freelancers. In addition to that, online freelance marketplaces offer a low cost way for geographically distant players to materialise their business ideas. There is an abundance of skilled workers in emerging economies (Indian subcontinent, Eastern Europe) that have low costs of living, and a healthy demand for skilled workers in developed countries (where local labour is expensive). Many businesses are opting for these websites for getting their job done by the remote workers. These websites give Freelancers (Job Seekers) a cutting edge platform on which to highlight the skills and experiences in attracting or retaining the businesses.

2. HOW IT WORKS

In Job Outsourcing websites, there is no direct relationship of employer – employee. Remote Work is a new-age concept of Work. It is found generally that this business model is more effective in revenue generation for “Nano” companies and individuals. The worker is termed as Job Seeker also known as Remote Coder or Freelancer and the employer is known as Job Provider. Freelancers are self-employed; they do not have a permanent work contract with an employer [1]. Usually they receive no fixed salary, but are paid on a fee basis for the work they undertake [2]. Many freelancers work on short-term assignments for multiple firms [3]. Often they have specific qualifications and are hired for particular knowledge-intensive tasks. This differentiates freelancers from consultants, who have an advisory role within the company and usually take no part in the organisation's processes themselves. The Outsourcing websites acts as a facilitator for those who are seeking jobs and for those who are looking out for hiring people to complete their jobs. The Job Outsourcing sites earn their revenue from both side of the stream. They charge a marginal fee from Job Providers and Job Seekers. The fee usually ranges about

10%[4] of the unit of work to be completed also known as Projects, these are usually minor and midsized projects , having a revenue ranging from as low as \$10 to \$5000.

These jobsites are beneficial for those who care to earn an extra income and also for homemakers, rural areas, physically challenged and unemployed, Remote Job Sites help to find their panacea for unemployment. The realization of payment for the Job Providers and Job Seekers is through direct deposits or withdrawal through online. The payment is made through the facilitator with the help of participating banks and other mode of payment methods like PayPal. The best thing about these websites are job provider and job seeker can be anywhere in the world and they are independent of the geographical location. Job seeker benefits from these jobs by searching on the internet and earning their livelihood from any place of stay without relocating or commuting daily to work place. The advantage for the job provider is they do not have to allocate any infra structure like building, furniture, office stationary etc., for performing the work. The choice for the job provider to have the work done at any point of time in the 24 hour period and 365 days of the year because of time zone advantages and most importantly of adversities of weather. The Outsourcing website acts as an arbitrator during billing by giving due share to the job seekers as well as protecting job providers investments, there is a mechanism for protecting monetary benefits of both side by having an escrow account. Escrow money is transferred only on fulfilling the condition that the job seekers have completed the assigned jobs. The job provider has the control on the website to acknowledge the job completion and request the release of funds from escrow account to the job provider. Any disputes are resolved between the job provider, job seeker and the disputed issue between the provider and the seeker are scrutinized and arbitration is done by the job facilitator. Jobs are posted by job provider and the outsourcing company websites by completing certain formalities and forms and agreeing to the terms and conditions of the facilitator.

Jobs are of two types: Firstly, on time basis – Where the job seeker is paid on hourly basis, second method is on project basis – fixed amount for the work estimated. The Facilitator usually provides some software tools to monitor for the job being performed on real time basis. This ensures and guarantees the quality performed by the job seeker the job provider has to get instantaneous updates. The Job Seeker also gets an assured amount for his work without any hassle. Usually job seeker and Job Provider are provided the feedback surveys at the conclusion of the work, to exchange and determine each other performance trust, confidence. These star ratings are visible to other registered members of the job site. This facilitates / alerts other job Providers / Job Seekers to gauge the respective partners. It has been found that 2 out of 10 software professionals in India are opting for this kind of remote work to augment their incomes besides their regular source of income through full time jobs.

2.1 Online Market Place-Some Realities

- Most of the workers are always online and in touch with their respective clients. Though, they miss the office atmosphere, they are always in touch with their job providers by internet messaging utilities like Skype™, google talk or by phone. There are also various job opportunities to be explored.
- There are third-party sites and tools assist remote contract workers and/or connect them to other remote contract workers. oDesk community for an example of remote contractors staying connected, sharing tips and best practices.
- Job Seekers never have to worry about their income as there are no shortage of Jobs, on successful completion of Jobs, the feedback rating helps to get jobs. The relationship is always struck between the Job Provider and Job Seeker, Job Provider always comes back to the known Job Seeker rather than unknown stranger and agree with future billing in a favourable way.

- The facilitator websites like eLance.com, oDesk.com etc., have the mechanism of guaranteed payment without any uncertainties for the work done. There is an escrow fund to protect the interests of Job Seeker and Job Provider.
- There is no dearth of jobs in these web portals, the jobs are not of Software development alone, any job that requires a computer and/or internet connection. Jobs such as Data entry , pay roll processing , business consulting, tele marketing, voice talents jobs are available, which require nil or very low technical skills.
- Even if in the initial stage there is low wages being paid, soon the job seeker in due course of time will build up reputation by positive feedbacks. The hourly rate for the job seeker will increase with his maturity, performance and experience. This will give an altitude for the right price for Job Seeker. In these companies the worker rate can exceed to average rate of \$30/hour to \$50/hour.
- Companies like oDesk.com conduct exams in different skills like PHP, ASP.net. various CMS like Joomla, Wordpress. In order to gauge the talent of the Job Seeker. The examination badges are visible along with the job seeker's profile which enables the contractor(Job Provider) to know the technical ability of the Job Seeker.

2.2 Services Offered by Online Marketplaces

The different categories of services offered by online remote job sites where the job seeker can find his work matching his skill and abilities are listed below.

Web Design / Internet marketing	Programming / Software / Database Development
Graphic Design / Presentations / Multimedia	Writing / Editing / Translation
Illustration / Cartooning / Painting / Sculpting	Sales / Telemarketing
Marketing / Advertising / Sales / PR	Management consulting
Engineering / CAD / Architecture	Photography / Videography
Networking / Hardware	Finance and Accounting
Enterprise resource planning (ERP)/ Customer	Broadcasting
Web Design / Internet marketing	Legal Services
Graphic Design / Presentations / Multimedia	Programming / Software / Database Development
Illustration / Cartooning / Painting / Sculpting	Writing / Editing / Translation
Marketing / Advertising / Sales / PR	Sales / Telemarketing
Engineering / CAD / Architecture	Management consulting
Networking / Hardware	Photography / Videography
Enterprise resource planning (ERP)/ Customer	Finance and Accounting
Web Design / Internet marketing	Broadcasting
Graphic Design / Presentations / Multimedia	Legal Services

TABLE 1: Work Categories in Freelance market place. [5].

2.3 Top Freelancing Job Sites – An Overview

There are various websites available in freelance marketplace which offers jobs. The most popular freelance marketplaces are Elance, Guru, vWorker, oDesk, and Freelancer, and the most popular categories of jobs are web development, programming, writing, translation, design, and multimedia [6] First commercial freelance site, Guru, was launched in 1998, followed closely by Elance in 1999 and vWorker (formerly RentACoder) in 2001. More recent entrants include oDesk

and Freelancer in 2004, People Per Hour in 2007, and LimeExchange in 2008 [7]. The following are the websites that are popular around the globe and India in particular.

Elance.com is a global online employment platform. Inspired by a 1998 *Harvard Business Review* article titled "The Dawn of the E-Lance Economy", the founders of Elance saw a need for technology capable of supporting virtual work and the first version of the site was launched in 1999. Two years later Elance also introduced a vendor management system for contractors and third-party services used by large enterprises. In 2006 Elance sold its enterprise software division and began the development of its current web-based platform for online, contingent work [8].

As of February 2012, Elance is used by approximately 140,000 businesses and 1.4 million registered contractors, who have collectively earned more than \$500 million to date [9].

Guru.com is a freelance marketplace. It allows companies to find freelance workers for commissioned work. Founded in 1998 in Pittsburgh as *uru Inc* by brothers Jon and James Slavet as an online clearing house for high tech workers seeking short-term contracts. The company was acquired in December 2002 by Unicru, a human resources software company based in Portland, Oregon. Guru's technology and staff remained with Unicru, focused on software to help large employers assess and hire job applicants [10]. Freelancers are still registered and getting facilitated. It's really a good site for writing jobs.

According to the latest statistics in Jan 2013 from Guru .com, Over 1 million users worldwide have used Guru.com to complete over 3 million tasks, share over 7 million messages and files, and create over 150 million dollars in value [11].

Freelancer.com is a global outsourcing marketplace, founded in 2009 by Matt Barrie. Its headquarters is in Sydney, Australia. Freelancer.com has acquired several outsourcing marketplaces including GetAFreelancer.com and EUFreelance.com, LimeExchange, Scriptlance.com, Freelancer.de, Freelancer.co.uk, Webmaster-talk.com, and vWorker. Freelancer.com is the world's largest outsourcing and crowd-sourcing marketplace for small business [12]. This site is popular for remote job seekers hailing from South Asia.

There are 6,932,691 professionals, \$1,043,490,561 projects posted and 4,173,741 projects as per the latest press report of Jan, 2013, Freelancer.com [13]

oDesk.com is a company with a global job marketplace and a series of tools targeted at businesses that intend to hire and manage remote workers. Based in Redwood City, CA, oDesk was founded in 2003 by Greek entrepreneurs Odysseas Tsatalos and Stratis Karamanlakis [4]. The company's site is entirely in English, and all transactions are made in U.S. dollars. The site does not post statistics regarding locations of buyer companies. oDesk offers Management and contractors of trust and you can get 20 bid balance per month.

There were around 2.5 million registered contractors and more than 7,90,000 jobs posted in the first half 2012 according to odesk.com [14].

2.4 Comparison of Freelancing websites

The following table gives a brief comparison of the bases of the freelancing websites which will help the job seeker to select the website for procuring the job.

Sl. No	Feature	E lance .com	Guru .com	Freelancer .com	Odesk .com
I. Free payment guarantee on every project					
1.	Free payment-guarantee on all fixed-price?	Nil	Yes	Nil	Nil
2	Free payment-guarantee on all hourly?	Yes	Nil	Nil	Yes
3.	Free payment guarantee on all crowd-sourcing?	Nil	Nil	Yes	Nil
II. Payment Model: fixed-price					
1	Offers Basic Fixed Price?	Yes	Yes	Yes	Yes
2	Free payment-guarantee on all fixed-price?		Yes	Nil	Nil
3	Protects your money with escrowing?	Yes	Yes	Yes	Nil
4	Arbitration				
5	Offers (at least) basic arbitration?	Yes	Yes	Yes	Nil
6	Offers it on all Projects?	Yes	Yes	Nil	Nil
7	Avoids "Pay Extra or Lose Your Guarantee" rules?	Nil	Yes	5% of milestone (\$5 minimum)	Nil
III. Fees					
1	Project Fees	8.75% (6.75% if over \$10,000)	10% (5% if you pay for upgraded membership)	13% Total (Employer 3%, Worker 10%). Worker pays only 3% with upgraded membership.	10%
2	Subscription fees	Optional \$9.95/month - \$39.95/month	Optional \$9.95/month - 45.44/month	Optional \$4.95/month - \$49.95/month.	Nil
3	Additional Fees:	Nil	Nil	10% GST tax fee for Australians	Nil
IV, Payment Model: hourly					
1	Offers basic hourly ?	Yes	Yes	Yes	Yes
2	Free Payment – Guarantee on all Hourly?	Yes	Nil	Nil	Yes
3	Protects your money with escrowing	Yes	Yes	Yes	Yes
4	Has a real-time timecard system?	Yes	Nil	Nil	Yes
5	Can prove presence via webcam ?	Nil	Nil	Nil	Yes
6	Can prove work via automatic desktop images?	Yes	Nil	Nil	Yes
7	Guarantees Payment for ALL types of work (including reading	Yes	Nil	Nil	Nil

	and purely mental)?				
8	Project Fees	0.75% (6.75% if over \$10,000)	10% (5% if you pay for upgraded membership)	13% total (Employer 3%, worker 10%). Worker pays only 3% with upgraded membership.	10%
9	Subscription fees:	Optional \$9.95/month - \$39.95/month	Optional \$9.95/month - \$45.44/month	/month - \$49.95/month.	Nil
10	Employer Verification Fees:	\$5	Nil	\$10	Nil
V. On-the-job trial: crowd-sourcing and trial sourcing					
1	Free payment guarantee on all crowd-sourcing?	Nil	Nil	Yes	Nil
V. Customer Service					
1	Offers you live support via email or chat?	Yes	Yes	Yes	Yes
2	Offers you Seven-day-a-Week Live Phone Support?	Yes	Nil	Nil	Nil
3	Company Success and Stability	Nil	Nil	Nil	Nil
4	Is currently profitable (net sales)?	Not available	Yes	Not available	Yes
5	Is ROI positive (profits exceed initial investment + costs)?	Nil	Yes	Nil	Yes
6	Is a member of the Inc. 5000 (fastest growing companies in the U.S.)?	Nil	2007, 2008	Nil	2009
VI. Affiliate Program					
1	Gives you cash back via an affiliate program?	Yes	Nil	Yes	Yes
2	Pays you a residual (more than once for the same referral)?	Nil	Nil	Yes	Nil
3	Total \$ for referring an avg. active employer (over 7 years)	\$51.00	N.A.	\$27.00	\$50
VII. others					
1.certifications					
	Allows you to prove your advanced skills via certifications?	Yes	Yes	Nil	Yes
	offers unlimited free certifications?	Yes	Nil	Nil	Yes
2. Rating					
1	Offers a double-blind rating system?	Nil	Nil	Yes	Yes
2	Shows all negative ratings/comments given to workers?	Yes	Nil	Yes	Nil
3.Employer Qualification					
1	Shows all employers' non-action ratio?	Yes	Nil	Nil	Nil
2	Confirms Employer's Phone numbers?	Yes	Nil	Yes	Nil

3	Confirms Employer's Phone numbers PayPal Accounts?	Yes	Nil	Nil	Nil
4	Confirms employers' credit cards	Yes	Nil	Nil	Yes

TABLE 2: Freelancing Websites – A Brief Comparison [15].

Table 3 shows the categories of jobs available in freelancing job sites .

S. NO.	JOB CATEGORY	ELANCE .COM	GURU .COM	FREELANCER .COM	ODESK .COM
1.	Website Development & Programming	47%	35%	55%	44%
2.	Sales & Marketing	7%	10%	14%	16%
3.	Legal (IT)	1%	1%	2%	-
4.	Finance & Management	1%	2%	-	3%
5.	Engineering & Manufacturing	1%	2%	-	-
6.	Design & Multimedia	21%	17%	10%	12%
7.	Admin & Support	7%	-	1%	9%
8.	Writing and translation	15%	12%	8%	14%
9.	Hardware, Mobile, Networking & Others	-	3%	10%	2%

TABLE 3: Category wise Freelancing Jobs as on 2010 [6].

The Table 3 clearly shows that although maximum number of jobs is available in software field, but there is also other type of jobs which does not need any prior software qualification.

3. CRITICAL ANALYSIS

As already mentioned, the online job portals is divided into Job providers and job seekers. The Job providers are concentrated in North America and the Job seekers are scattered across Douth Asian Sub Continent. There are around 340,526 freelancers in South Asia on odesk.com, which includes major chunk from India, Pakistan and Bangladesh.. There are 440,217 freelancers on guru.com from South Asia . There are 43,716 freelancers from India as on April 7, 2013 on freelancers.com and 134,601 jobs from India from the online remote job portal elance.com. It is found that job seekers in these sites do jobs individually and also form a team as loosely coupled teams. The statistics reveal that Indian IT freelancers are more preferable for crowd sourcing as the job seekers from South Asia, India are English speaking and have technical skills at the same time. Looking from the perspective of job provider it is found that aspiring entrepreneurs become job providers as micro entrepreneurs of retail sector, selling goods like t-shirts, leather merchandise online they tend to outsource website development on the remote job portals, the tend to have their entrepreneurial business work in the US daylight hours and outsource the work to geographically / time-zone shifted location like South Asia. This helps them in execution of their daily routines round the clock. South Asian job seekers tend to have more affinity among the US job providers aka micro entrepreneurs.

Even though the rate per hour is less than the stipulated labour laws(source from the website of job provider even getting jobs like \$2 per hour), it is logical that the job contract is mutually beneficial on both the job seeker and job provider as there exists a adhoc currency differences vis a vis US dollar and Indian Rupee. As the remote job seekers get their dollar converted to local currency it translates to a matter-of-fact salary if worked as full time job in a local company.

For individual Job Seeker, such on line job portals are popular as there is marginal or nil entry fees involved. Job Seekers find it comfortable to pay the commission charges to the portals after the job is done rather than paying the entry fee upfront. There is lot more population working remotely job seekers opt for remote jobs because of the widening network of broadband technologies. More and more Job providers avoid hassles of a regular company like labor laws and legal compliances in remote jobs are more relaxed and not widely understood in the legal fraternity.

4. IMPLICATIONS OF CURRENT STUDY

Because of online job portals, people now have more scope of getting employment and thus earning an income for their livelihood. This implication of online jobs will have an impact on lowering unemployment ratios among urban youth. Now online jobs can be pursued as serious career and commuting is not mandatory. In fact, there are lot more savings by not using transportation for going to their place of work. Rather work comes to the job seekers drawing room. Surely, the job can save time, money and energy by not commuting to work. This benefits in overall wellbeing of the person who are pursuing this as serious career option.

5. AREAS FOR FURTHER STUDY

The following are the areas where the need for further research is to be explored.

1. How effective for Job Seekers to supplement their household income and replace the regular job?
2. How effective is to consider Remote job work as a serious profession?
3. What is the impact of freelancing job on psychological and social life among the Remote Job Seekers?
4. How competitive is the economy of the Online job portals vis a vis big corporations?

6. CONCLUSION

Although the traditional job market continues to struggle worldwide, the future is optimistic for online work. Most of the Indian freelancers have to depend on non-Indian freelancing websites like Elance.com, Freelancer.com and oDesk.com to earn money through freelancing. It is not that these freelancing websites are in vain but one cannot associate oneself with non-indigenous job market portals wholly.

According to Business News Daily dated 30 Oct. 2012, it is found that the average freelancer can expect to earn 43% more in 2013 than they did in previous year. This rise in earnings is translating into more jobs for all as 42% of independent professionals plan to hire other freelancers to build their businesses in 2013.

"This report truly reflects Mary Meeker's thesis that through software and the Internet we're experiencing the *reimagination of everything*," reflects Matt Barrie, Chief Executive of Freelancer.com. "Every industry we can think of is quite abruptly turning into a software business, and every job function is increasingly being performed using software tools in the cloud..."

The online remote job sites boost the software industry revenues in an unprecedented way. This also empowers the budding entrepreneurs to form "Nano" companies and quick healing for unemployment ratio reduction of skilled software man power in the current Indian scenario.

7. REFERENCES

1. Kalleberg AL (2000) Nonstandard employment relations: part-time, temporary and contract work. *Annual review of sociology* **26**(1), 341–365.
2. Kunda G, Barley SR and Evans J (2002) “Why do contractors contract? The experience of highly skilled technical professionals in a contingent labor market”. *Industrial & Labor Relations Review* **55**(2), 234–261.
3. Huckman RS and Pisano GP (2006) The firm specificity of individual performance: evidence from cardiac surgery. *Management Science* **52**(4), 473–488.
4. <http://www.odesk.com> (accessed 30 January 2013)
5. http://en.wikipedia.org/wiki/Freelance_marketplace (accessed 30 January 2013)
6. Charles M.Kozierok (2012) “The Online freelancing guide-An analysis and review of popular online freelance marketplace sites” Available: <http://www.FreelancingGuide.net> (accessed 1 February 2013).
7. S. Bonar (2010) The Freelance Marketplace Review. WhichLance.com.
8. <http://en.wikipedia.org/wiki/Elance> (accessed 30 January 2013)
9. <http://www.elance.com> (accessed 30 January 2013)
10. <http://en.wikipedia.org/wiki/Guru.com> (accessed 30 January 2013)
11. <http://www.guru.com> (accessed 30 January 2013)
12. <http://en.wikipedia.org/wiki/Freelancer.com> (accessed 30 January 2013)
13. <http://www.freelancer.com> (accessed 30 January 2013)
14. <http://www.odesk.com> (accessed 30 January 2013)
15. <https://www.vworker.com> (accessed 30 January 2013)

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