

# Applying Customer Lifetime Value to Justify Investment in Clinic Management System to Improve Customer Engagement in a Multi Chain Clinic

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**Abstract**—In Harmony Clinic is the first vaccination clinic in Indonesia. Currently, there are potential competitors readily acquire its market. The aims of this study are to explore customers' perception, frustration points, analyze the root causes, ways to improve customer experience, investment needed and its justification. We did initial field exploration using qualitative analysis. Customers' insights were derived from IDI and FGD. Operational processes were analyzed using visual stream mapping and any gap between what should be and what has been done were identified. Potential problems were analyzed using quantitative analysis to quantify customer complaint rate, its classification, frequency of operational defects, and its pareto chart. Fish bone diagram was used to analyze the potential root causes. We propose to provide quality personnel training & performance management, establish service procedure, and system implementation to support operation. Current clinic management system is not sufficient to support growing multi-chain clinics like ours anymore, hence an upgraded version is needed. We then analyze the NPV of investment needed, our WACC, our current cumulative total CLV and finally compare it with predicted future cumulative CLV produced from increasing customer engagement using sensitivity analysis to ultimately justify our investment.

**Keywords**—Operational excellence; customer experience; customer engagement; CLV; investment analysis; WACC

## I. INTRODUCTION

Infectious disease outbreaks still happen repeatedly throughout Indonesia. The nationwide diphtheria outbreak just occurred in 2017 [1]. In Harmony Clinic (IHC) is the first vaccination clinic in Indonesia focusing towards prevention and vaccination [2].

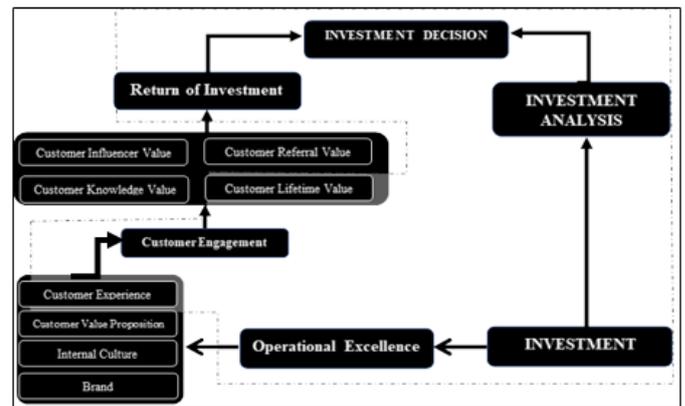


Fig. 1. Conceptual framework.

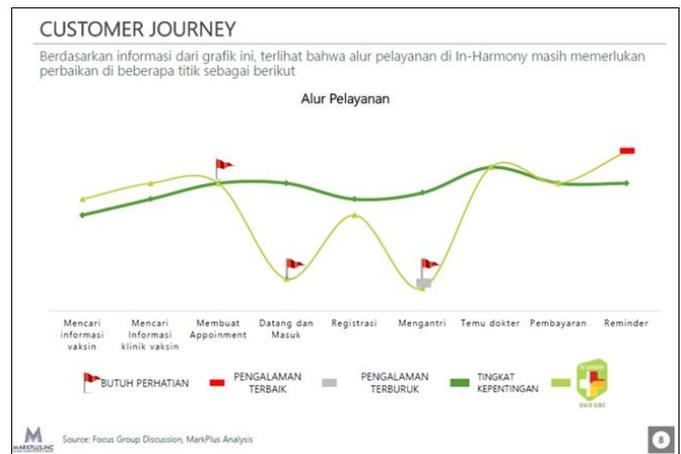


Fig. 2. Customer Journey in IHC [3].

Lately, competitors appeared, acquiring IHC potential markets, thus reducing IHC potential revenues. Meanwhile, in an internal audit, process variants were recognized, producing negative customer experiences (CX) and reduced customer engagements (CE), further reduce its customers. Therefore, this research is aimed to:

- Discover customers' perception, frustration points (FP), and the root causes;
- Explore solutions to improve CX and alleviate FP;
- Determine investment needed and justify the investment.

## II. METHODOLOGY AND CONCEPTUAL FRAMEWORK

Customers' insights were explored using qualitative analysis through in-depth interview (IDI) and focus group discussion (FGD). Operational processes and gap producing defects were analyzed using visual stream mapping (VSM).

Potential problems were analyzed by quantitative analysis to quantify customer complaints, its classification, frequency of operational defects, & its pareto chart. Fish bone diagram was used to analyze potential root causes. Customer lifetime value (CLV) and investment analysis were counted quantitatively.

## III. BUSINESS ISSUE EXPLORATION

### A. Customers' Insight Exploration with IDI and FGD

At first, an IDI was done to a loyal customer to understand her underlying values of getting a premium vaccine in IHC. It was concluded from this interview that trust, comfort, and peace of mind were what she valued during her interaction with IHC. Her customer journey was also explored to understand her experiences while visiting IHC. Based on this exploration, several customer FP were discoverable:

- Unanswered calls.
- Small place with lack of observable signboard.
- Some vaccinators failed to deliver comfortable vaccination service
- Customer service officers (CSO) failed to deliver vaccination reminder
- Prolong waiting time.

Following up IDI results, further customers' exploration was continued using FGD. Five patients from different customer segments were invited to attend. Some customers' expectation captured in this FGD were [3]:

- Vaccination reminder and scheduler
- Fast and convenient service
- Vaccine stock availability

A customer journey map (figure 2) was then drawn representing CX and customers' perceived service level. Customers' insights that was discovered:

- Several customer touchpoints had become FP, i.e.:
  - when finding and arriving in the clinic and;
  - waiting time;
- Contrary from IDI, vaccination reminder has been perceived as best CX.

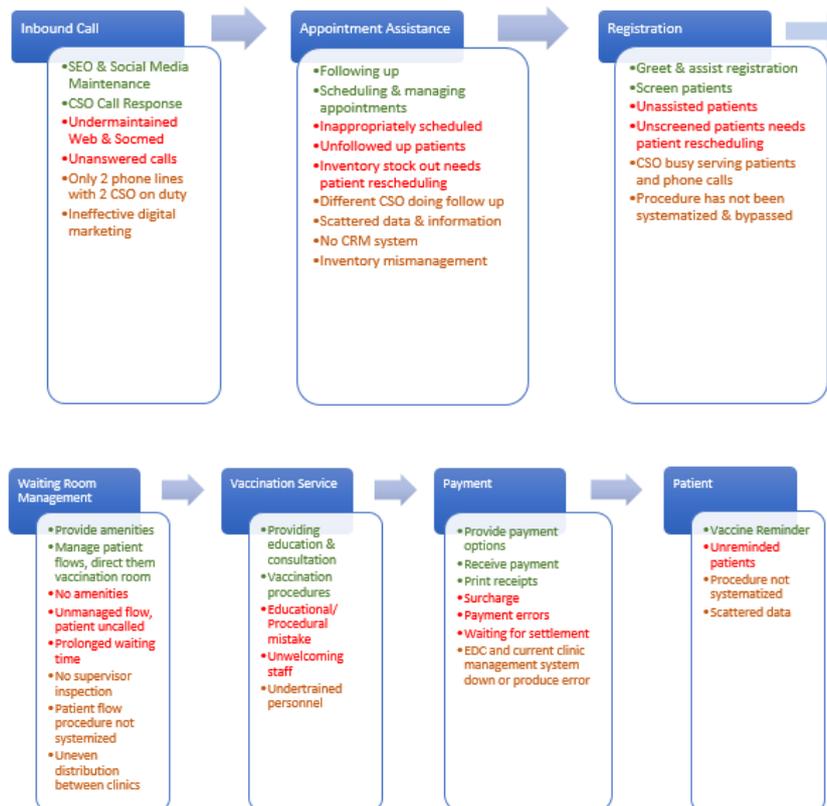


Fig. 3. . VSM of operational process; Blue: Operational process; Green: Team activities; Red: Customer FP; Brown: Possible causes.

**B. Internal Operational Exploration using VSM**

VSM was created to explore operation and visualize processes, team activities, identify FP and possible causes for each (figure 3). Having created VSM, voice of customers from IDI & FGD could then be compared with FP mapped in VSM. Similarities and controversies between what customers have experienced and what’s happened in operation could be identified and confirmed. Several confirmed FP were unanswered calls, vaccination education/procedural mistake, un-reminded patients, and prolonged waiting time.

Having compared between customers’ insight and VSM, it was discovered that some customer expectations were delivered inconsistently by IHC:

- Fast and convenient service;
- Vaccination reminder;
- Vaccine availability.

These experiences delivered what has been perceived as operational excellence (OpEx) by customers but have produced many complaint cases due to inconsistent service delivery, warrant further exploration using quantitative analysis.

**C. Internal Exploration by Primary Data Quantitative Analysis**

From the previous findings, internal factors that might produce or underlie the voice of customers above were explored. Data were collected retrospectively either from 2017 (for customer complaint rate) or Q1 2018 (for operational defect data), derived from consolidated meeting reports, existing clinic management system (CMS) software, as well as accounting data. The number of patients in January, February, and March 2018 were 765, 582, and 618 patients respectively.

1) *Customer complaint rate*: How frequent customers had complained towards IHC in one full year was counted and classified based on voice of customers (table 1).

2) *Frequency of operational defects and the pareto chart*:

a) *Inappropriate Patient Scheduling (IPS)*: IPS was defined as overlapping patient schedule at the same time and place. The frequency of IPS in January, February, and March 2018 were 115; 76; and 74 patients respectively; creating 265 cases in 3 months.

TABLE I. FREQUENCY OF CUSTOMER COMPLAINTS 2017, CLASSIFIED BASED ON VOICE OF CUSTOMERS

Complaint Categories	Frequency
Inappropriate Patient Scheduling	13
Stock Issue	8
Prolonged Waiting Time	6
Un-reminded Patient	4
Vaccinator Skills	3
Location Issue	0
Unanswered Calls	0
Miscellaneous issues	9
TOTAL	43

b) *Inventory Mismanagement (IM)*: Any errors causing inventory mismatch were audited and categorized into 3 IM categories: 1) Inventory miscalculation; 2) Wrong input; 3) Unrecorded transaction. The frequency of IM due to miscalculation, wrong input, and unrecorded transactions were 16; 10; and 22 respectively; creating 48 cases in 3 months.

c) *Prolonged Waiting Time (PWT)*: PWT was defined as waiting time, from registration up to service delivery, more than 30 minutes. The frequency of PWT in January, February, and March 2018 were 21; 12; and 7 patients respectively; creating 40 cases in 3 months.

d) *Un-reminded Patients (UP)*: Reminder was defined as calling, texting, or emailing the scheduled patients for next visit and a successful reminder as a reminder that has been responded by the patients. The frequency of UP due to unrecorded in reminder table, recorded but un-reminded, and unsuccessful reminder (recorded – called for reminder – but stopped half-way before patient responded) in January, February, and March 2018 were 19 (0.02%); 524 (65%); and 93 (11.6%) respectively; creating a total 636 (79.7%) UP cases in 3 months.

TABLE II. OPERATIONAL DEFECT IMPACT, Q1 – 2018

Defect Type	Defect Frequency	Complaint Frequency	Weight	Defect Impact
IPS	265	13	3	10.335
IM	48	8	10	3.840
PWT	40	6	3	720
UP	636	4	5	12.720

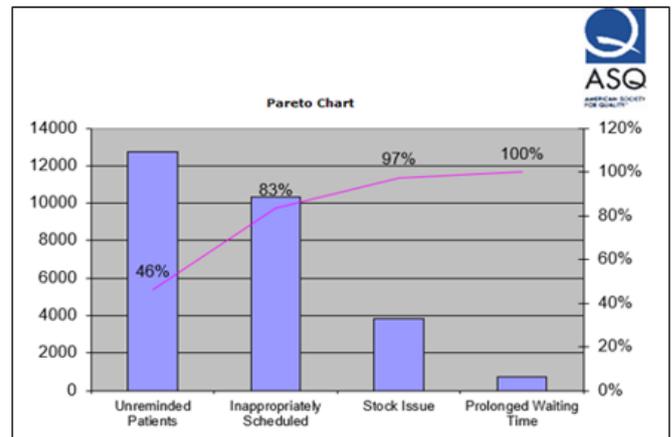


Fig. 4. Pareto Chart of Defect Impact, Q1 – 2018.

e) *Pareto chart of operational defect*: Each type of operational defects contributes different business impacts. Hence, different weights were given, reflecting business impact. Greater weight was given to an issue that not only produce complaints but also monetary and non-monetary loss for the company (e.g. Losing customer or losing potential revenue). While any issue that only produce complaints (discomfort or perceived inconvenience) gain lower weight. The multiplication of any defects frequency with complaints frequency times with its weight produce what is defined as

Defect Impact, calculated in table 2. Based on the table, a pareto chart was created to show visually which operational defect contribute biggest impact and prioritize in finding its solution (figure 4). Apparently, UP contributed to the highest percentage of defect impact, followed by IPS. Together, both of them contribute to 83% of IHC defect impact.

D. Root Cause Analysis

Root cause analysis using fish bone diagram (figure 5) was used to describe potential causes of UP using the question, “Why did patients happen to be un-reminded?”

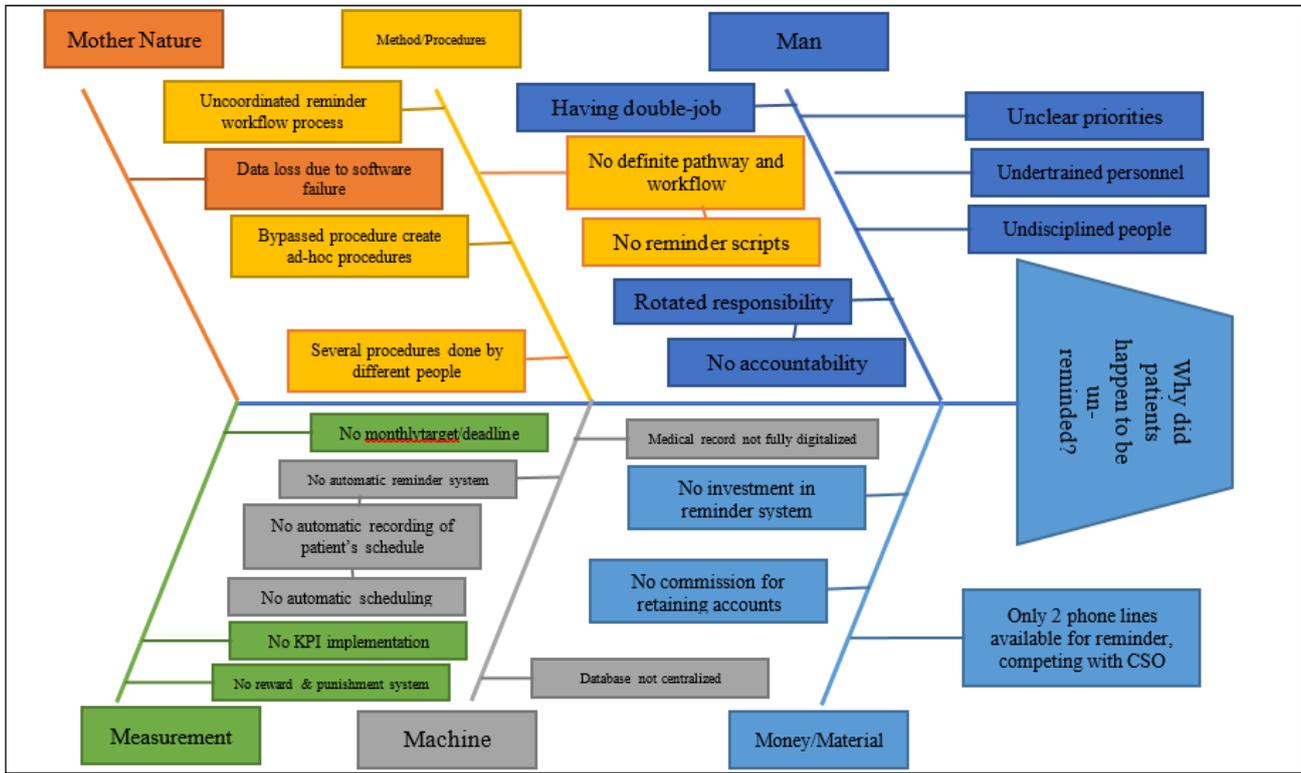


Fig. 5. Root cause analysis with fishbone method of “Why did patients happen to be un-reminded?”.

Analyzing the fish bone diagram, several related root causes can be grouped as follows:

- Lack of established procedure
- Lack of established system and database
- Lack of qualified dedicated personnel

IV. RESULTS AND DISCUSSION

To address the 3 grouped of root causes, several possible solutions are proposed: providing quality personnel training & performance management; establishing service procedure & workflow; and system implementation.

A. Providing Quality Personnel Training and Performance Management

Even in the United States healthcare is not as safe as it should be. This has been identified and publicized in a Journal from Institute of Medicine: “To Err is Human: Building a Safer Health System” in 1999 [4]. IHC commits to deliver OpEx to improve CX and achieve better engagement. Hence, IHC will develop a new set of training to equip CSO with

service mindset that might be known as “Service Excellence Requirement to Deliver Experience (SERVE)”.

B. Establishing Service Procedure and Workflow

Personnel training must be accompanied with established workflow and solid procedure to train to. Hence, a solid service blueprint to establish workflow and procedures needed by CSO to deliver OpEx will have to be created in a project called “Workflow and Procedures to Deliver Experience (WE PROVIDE)” Project.

C. System Implementation

IHC must plan in implementing a new technology, due to the outdated CMS currently being used. The current CMS being used is a complete but rigid small single clinic management software, offering no customization, nor integration capabilities.

IHC considers a better multi-chain clinic CMS, featuring multi-chain clinic operation capabilities, modular application, multi-site warehouse management, customizable reports, multiple methods of patient reminder, and support API integration. It is a cloud-based SaaS software with annual subscription paid upfront and additional subscription will be

based on additional users and modules subscribed. The principal has proposed budget as follows: Annual software subscription – USD 3,500 for 25 Users; API integration development – USD 2,000 (one-time); Training and implementation – USD 300 (one-time).

Should a software upgrade is planned for the future 5 years of subscription without any major changes, the total investment and its present value calculation can be calculated as follows:

Total investment (USD 5.800 for year I plus annual USD 3.500 for the rest of 4 years) would become USD 19.800. Assuming BI inflation target of 3.5% [5], the NPV would become USD 18.025, equals to IDR 270.375.000 (assuming IDR 15.000 per USD exchange rate). Five years is considered as the longest horizon of such software usage IHC can foresee.

**D. Investment Analysis**

IHC must analyze whether such investment will bring considerable future return, started by identifying the NPV of total investment, calculating NPV of future return, and ended with comparing between those two. CLV is used as an NPV prediction of future return due to the reason of investment, i.e. upgrading IHC capability to deliver OpEx to improve CX and

achieve better engagement. Hence, IHC WACC should be calculated to calculate CLV.

1) *Calculating in harmony clinic Weighted Average Cost of Capital (WACC):* Before calculating WACC, Beta ( $\beta$ ) must be calculated. Calculating  $\beta$  is challenging since IHC is not a publicly traded company and there is no similar industry  $\beta$  data available in Indonesia. Hence,  $\beta$  from US hospitals/healthcare data was used as a proxy to calculate IHC  $\beta$  using Hamada Equation [6].

$$\beta_{L IHC} = \beta_u * (1 + (1 - t) (D/E)) \tag{1}$$

Whereas:

- t = Indonesian Corporate Tax Rate = 25%;
- Debt Proportion = 30%;
- Equity Proportion = 70%;
- $\beta_u$  = unlevered beta;
- $\beta_u$  Hospital/Healthcare (US)[7] =  $\beta_u IHC = 0.5$ ;

Then:

$$\beta_{L IHC} = 0.5 * \{1 + [(1-25%) * (30\%)]\} = 0.6125$$

**Cost of Capital** =  $k_E [E/(D + E)] + k_D [D/(D + E)]$  (2)

**WACC** =  $\{E/(D+E) * [R_f + (\beta_{IHC} * \text{Equity Risk Premium})]\} + \{D/(D+E) * [R_f + \text{Default Spread}] * (1 - \text{Tax Rate})\}$  (3)

**WACC** =  $\{70\% * [7.5\% + (0.6125 * 7.62\%)]\} + \{30\% * [7.5\% + 0.6\%] * (1 - 25\%)\}$   
 =  $\{0.7 * 12.17\%\} + \{0.3 * 8.1\% * 75\%\}$   
 =  $0.10339575 = 10.34\%$

Fig. 6. WACC calculation for IHC.

WACC for IHC is calculated figure 6 using data in table 3 and the cost of capital formula [6].

TABLE III. REQUIRED DATA TO CALCULATE IHC WACC

Variable	Value	Reference
Risk-free Rate (Rf)	7.5%	FR0075 Government Bond
Equity Risk Premium (Indonesia, 2018)[8]	7.62%	Damodaran Country Default Spreads & Risk Premiums [8]
Default Spread	0.6%	Damodaran Capital Structure for Smaller & Riskier Firms [8]
$\beta$ Levered IHC	0.6125	
Corporate Tax Rate Indonesia	25%	

2) *Quantifying the CE values through CLV:* CLV is calculated as a reference to measure any interventions' effectiveness to increase CE. All revenue, cost, and average purchasing years data was collected from IHC accounting system. Customer retention rate was calculated from average purchasing years.

To calculate CLV, a formula provided by HBR [9] is used using data from table 4 below:

$$CLV = \frac{M \times (1 + i)}{(1 + i - RR)} - AC \tag{4}$$

Whereas:

- M = annual profit (revenue – costs)
- i = firm discount rate
- RR = retention rate
- AC = acquisition/retention costs

Hence:

$$\text{Average IHC customer CLV} = [ (1.395.291 - 722.034) * \{ (1 + 10.34\%) / (1 + 10.34\% - 3,7\%) \} ] - 50.918 = \text{IDR } 645.783$$

$$\text{Cumulative (Total) CLV} = \text{CLV of average customer} * \text{numbers of customers} \tag{5}$$

Hence:

$$\begin{aligned} \text{Cumulative CLV} &= \text{IDR } 645.783 * 5538 \\ &= \text{IDR } 3.576.348.782 \end{aligned}$$

TABLE IV. REQUIRED DATA TO CALCULATE

Variable	Value
Average customer's annual revenue	IDR 1.395.291
Average customer's annual variable costs	IDR 722.034
Average customer's acquisition or retention cost	IDR 50.918

Table 4. Cont.

Average purchasing years	1.038562
Customer retention rate	3,7%
Numbers of customers	5538
Firm discount rate (WACC)	10,34%

3) *Investment sensitivity analysis*: To justify whether the investment worth the return, three possible future returns should be calculated: the worst-case scenario, most possible scenario, and best possible scenario.

Period	Current	2018	2019	2020	2021	2022
Average Annual Revenue for a Customer	Rp1,395,291	Rp1,395,291	Rp1,395,291	Rp1,395,291	Rp1,395,291	Rp1,395,291
Average Annual Variable Costs for a Customer	Rp722,034	Rp722,034	Rp722,034	Rp722,034	Rp722,034	Rp722,034
Average acquisition or retention cost for a customer	Rp50,918	Rp50,918	Rp50,918	Rp50,918	Rp50,918	Rp50,918
Customer Retention Rate*	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Number of Customers	5538	6281	6689	7124	7587	8080
Firm's Discount Rate (WACC)	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%
<b>Average Customer Lifetime Value (CLV)</b>	Rp645,783	Rp645,783	Rp645,783	Rp645,783	Rp645,783	Rp645,783
<b>Total Customer Lifetime Value</b>	Rp3,576,348,782	Rp4,056,165,890	Rp4,319,836,954	Rp4,600,647,955	Rp4,899,713,076	Rp5,218,218,924

Fig. 7. Worst-case scenario of CLV calculation.

In the worst-case scenario (figure 7), it is assumed that in the next 5 years, only number of customers is expected to grow steadily at 6,5% y-o-y (based on historical data). Other parameters are considered stagnant, i.e. there is no additional CLV per customer. Difference of the predicted Total CLV in

the next 5 years with current CLV is calculated at IDR 1.641.870.142. Although it comes from customer growth, it outweighs total investment of the new system estimated at IDR 270.375.000.

Period	Current	2018	2019	2020	2021	2022
Average Annual Revenue for a Customer	Rp1,395,291	Rp1,395,291	Rp1,395,291	Rp1,395,291	Rp1,395,291	Rp1,395,291
Average Annual Variable Costs for a Customer	Rp722,034	Rp722,034	Rp722,034	Rp722,034	Rp722,034	Rp722,034
Average acquisition or retention cost for a customer	Rp50,918	Rp50,918	Rp50,918	Rp50,918	Rp50,918	Rp50,918
Customer Retention Rate*	3.7%	4.5%	5.3%	6.4%	7.7%	9.2%
Number of Customers	5538	6281	6689	7124	7587	8080
Firm's Discount Rate (WACC)	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%
<b>Average Customer Lifetime Value (CLV)</b>	Rp645,783	Rp650,670	Rp656,624	Rp663,905	Rp672,842	Rp683,865
<b>Total Customer Lifetime Value</b>	Rp3,576,348,782	Rp4,086,856,282	Rp4,392,355,196	Rp4,729,747,163	Rp5,105,009,924	Rp5,525,936,730

Fig. 8. Most possible case scenario of CLV calculation.

The most possible scenario (figure 8) gives slight optimistic view on CE value, in which assumed that in the next 5 years, number of customers and customer retention rate are expected to grow steadily at 6,5% and 20% y-o-y respectively. The investment is expected to increase customer retention rate, thus increasing CLV for every customer. Difference of the predicted Total CLV in the next 5 years with current CLV is calculated at

IDR 1.949.587.947, far outweighs the investment. There is a difference of predicted total CLV of IDR 307.717. 806 between the worst-case and most possible scenario, reflecting the potential value of additional retention rate produced by the investment, which still outweighs the investment itself.

Period	Current	2018	2019	2020	2021	2022
Average Annual Revenue for a Customer	Rp1,395,291	Rp1,534,820	Rp1,688,302	Rp1,857,132	Rp2,042,845	Rp2,247,129
Average Annual Variable Costs for a Customer	Rp722,034	\$794,237.13	\$873,660.85	\$961,026.93	\$1,057,129.63	\$1,162,842.59
Average acquisition or retention cost for a customer	Rp50,918	\$56,009.71	\$61,610.68	\$67,771.75	\$74,548.92	\$82,003.81
Customer Retention Rate*	3.7%	4.5%	5.3%	6.4%	7.7%	9.2%
Number of Customers	5538	6281	6689	7124	7587	8080
Firm's Discount Rate (WACC)	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%
Average Customer Lifetime Value (CLV)	Rp645,783	Rp715,737	Rp794,516	Rp883,657	Rp985,107	Rp1,101,372
Total Customer Lifetime Value	Rp3,576,348,782	Rp4,495,541,910	Rp5,314,749,788	Rp6,295,293,474	Rp7,474,245,030	Rp8,899,576,362

Fig. 9. Best-case scenario of CLV calculation.

The best-case scenario (figure 9) gives the most optimistic view on CE value, in which assumed that in the next 5 years, number of customers, customer retention rate, and the average annual revenue per customer are expected to grow steadily at 6,5%; 20%; and 10% y-o-y respectively. Average annual variable costs, acquisition, and retention costs are considered increasing proportionately. Difference of the predicted Total CLV in the next 5 years with current CLV is calculated at IDR 5.323.227.580, far outweighs the investment. There is a difference of predicted total CLV of IDR 3.681.357.438 between the worst-case and best-case scenario, reflecting the potential value of additional retention rate and average customer basket size produced by the investment, which far outweigh the investment itself.

Based on these scenarios in investment analysis, the investment is justifiable because even in the worst-case scenario, the difference of total CLV for the next 5 years still far outweighs the present value of investment needed for the next 5 years.

## V. CONCLUSION

Customers have positive perception towards IHC vaccination service. They appreciate vaccination reminder, fast and convenient service, and vaccine availability. Unfortunately, IHC couldn't deliver the services consistently, producing a lot of customer complaints due to operational defects. Having explored internally and externally, defect impacts were calculated, and the root causes were defined. To overcome these business problem, three interrelating solutions were provided: Provide quality personnel by initiating service training program called SERVE to equip frontlines; Establish a solid service procedure & workflow to deliver OpEx in a project called WE PROVIDE; Implement a new CMS to ensure reliable delivery of service and OpEx. The system is planned for future 5 years usage with calculated net present

value of the investment at IDR 270M. Due to the purpose of investment, i.e. delivering OpEx to improve CX and increase CE, investment must be challenged whether it will provide CE value and bring higher returns using CLV as an CE value indicator. Investment sensitivity analysis was done by developing three scenarios of possible future CLV. It then generated insight that even in the worst-case scenario, the CLV difference far outweighs the investment. Hence, based on the NPV of predicted CLV in the next 5 years, the investment is justifiable.

## REFERENCES

- [1] SEARO WHO, Update on Diphtheria in Indonesia – December, 2017 [Online] Retrieved from: [http://www.searo.who.int/indonesia/topics/immunization/diphtheria\\_in\\_indonesia\\_one\\_pager.pdf?ua=1](http://www.searo.who.int/indonesia/topics/immunization/diphtheria_in_indonesia_one_pager.pdf?ua=1).
- [2] In Harmony Manuals, 2017, unpublished document.
- [3] MarkPlus Analysis, Focus Group Discussion, 2018, unpublished document.
- [4] L.T. Kohn, J. Corrigan, and M.S. Donaldson, To err is human: building a safer health system (Vol. 6). Washington, DC: National academy press, 2008.
- [5] Bank Indonesia, Inflation Target, 2018, [Online]. Retrieved from: <https://www.bi.go.id/en/moneter/inflasi/bi-dan-inflasi/Contents/Penetapan.aspx>.
- [6] A. Damodaran, Applied Corporate Finance, (3rd Ed). US: John Wiley & Sons, Inc, 2011.
- [7] Damodaran, Betas by Sector (US), 2018, [Online] retrieved from: [http://pages.stern.nyu.edu/~adamodar/New\\_Home\\_Page/datafile/Betas.html](http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html).
- [8] Damodaran, Country Default Spreads and Risk Premiums, 2018 [Online] Retrieved from: [http://pages.stern.nyu.edu/~adamodar/New\\_Home\\_Page/datafile/ctrypre.html](http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctrypre.html).
- [9] T. Steenburgh, and J. Avery, HBR Tools: Customer Lifetime Value, Harvard Business Review, 2015 [Online] Retrieved from: [www.HBR.Org](http://www.HBR.Org).