AN APPROACH OF COST MANAGEMENT, QUALITY MANAGEMENT, AND TECHNOLOGICAL APPLICATIONS FOR FACTORY MANAGEMENT – A CASE OF DCT IN VIETNAM CONSTRUCTION MATERIAL INDUSTRY

Nguyen Ngoc Thang, PhD (1st author)
Tien Giang University, Vietnam

Dinh Tran Ngoc Huy, MBA (corresponding)
Banking University HCMC, Ho Chi Minh city, Vietnam – International University of Japan, Japan

ABSTRACT

In emerging markets such as Vietnam, there are certain risks in construction material sector. For instance, competitive risk from Chinese competitors. Then quality risk (low quality) for products looking good at the beginning but through times, quality reduced. Another risk is that many construction material companies keep high inventories and burden losses.

This study will use OLS regression model to estimate determinants of cost of a typical construction material company, DCT in Dong Nai Province, Vietnam.

Then we will propose cost management solutions and total quality management for the company. For instance, firms can use video camera to monitor operation and apply ICT, AI and robots in production activities. Moreover, Video camera application can help labor safety.

Next, firms need to adapt to regulations in which The Ministry of Construction stimulate technical requirement and quality management of construction materials and products. Also we suggest project management board and consultants to supervise inspection, take samples of materials for testing, checking materials record. If the material profile is not satisfactory, the procedure is required to remove that material from the site. If successful, conduct material testing; materials with successful test results will be tested and accepted for input materials and put into construction.

Last but not least, we recognize that: Admin cost, net profit and R has negative corr. With COGS . And Lending rate and COGS has negative impact on Admin cost .

Key words: quality management, COGS, Admin cost, construction material, multi factors, econometric, cost management, risk management

JEL: M21, G30, G32, G38

1. Introduction

First, we recognize we need researches on technological applications for better factory management and as well as cost management for firm development.

Second, There are several kinds of risk on this material industry: competitive risk, for instance. Imported material for construction from overseas such as China with various designs and cheap production cost that become a threat for domestic materials.

Third, total quality management also needed to ensure quality of material products for construction and build proper processes for checking and monitoring construction materials products.

Therefore, In this paper we mainly focus on recommendations of using video camera for observing factory operation, and conduct an econometric model for better cost management and enhance business results.
We also select a case of Dong Nai Roofsheet And Construction Material JSC (DONAC) on stock exchange and do business in construction material sector for cost econometric model performance.

Research questions:
Question 1: What are technological applications such as video camera can help better factory monitoring?
Question 2: What are cost factors econometric model?

2. Literature review
First, Trivelas and Satouridis (2013) stated MIS performed well to help firm creativity and productivity.

Moreover, Sibanda et al (2020) mentioned digital technology has good role in this era.


Then, We summarize previous studies as follows:
Table 1 – Summary of previous studies

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Contents, results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocca et al</td>
<td>2016</td>
<td>demonstrate the effectiveness of video technology at supporting the identification of the risks connected to unsafe behaviours of the work-force and critical conditions of the working environment. Video surveillance provides several benefits as opposed to in person observations, such as: non-biased and accurate accident data; in-depth analysis; observations possible not in real-time; observer not exposed to risks; undisturbed work activity; possibility of longer observation periods. The recorded videos can facilitate the identification of safe practices and the best risk management approaches as well as be used to improve training sessions. Further investigation is required to assess the effectiveness of the system in the long term.</td>
</tr>
<tr>
<td>Rai et al</td>
<td>2018</td>
<td>In broad terms, advanced video-based surveillance could be described as an intelligent video processing technique designed to assist security personnel’s by providing reliable real-time alerts and to support efficient video analysis for forensic investigations. Author deals with the various requirements for designing a robust and reliable video surveillance system. Also, it is discussed the different types of cameras required in different environmental conditions such as indoor and outdoor surveillance.</td>
</tr>
<tr>
<td>Giebe et al</td>
<td>2019</td>
<td>Firms can achieve better service with “Big Data &amp; Analytics”.</td>
</tr>
<tr>
<td>Feitosa et al</td>
<td>2019</td>
<td>Disruptive technologies are triggers that transform the nature of work</td>
</tr>
<tr>
<td>Hoang Thanh Hanh, Dinh Tran Ngoc Huy</td>
<td>2021</td>
<td>Firms can build cost econometric model for better results</td>
</tr>
<tr>
<td>Nguyen Dinh Trung, Dinh Tran Ngoc Huy, Trung Hieu LE</td>
<td>2021</td>
<td>ML - Machine Learning and IoTs and AI together also has certain impacts in hospitals and medicine sector where public health data and patients information and diseases information are recorded and processed faster with Big Data</td>
</tr>
<tr>
<td>Nguyen Dinh Trung et al</td>
<td>2021</td>
<td>applying TQM will Gain performance commitment from members, staff, and the department. Build a new working style that is scientific and systematic, easy to monitor.</td>
</tr>
</tbody>
</table>
3. Methodology

Method and Data

First we use qualitative analysis and inductive and synthesis method for TQM solutions.

Second we use literature review for related studies.

Third we use econometric model with OLS for cost factors - econometric model.

Next we look at below figure:

- standard dev. of COGS higher than that of admin cost (fig 1 and fig 2)
- corr. Between COGS and lending rate higher than between COGS and sale cost (fig 3)
- on contrary, corr. Between admin cost and lending rate lower than between admin cost and sale cost (fig 4)

Figure 1 - Cost factors stats (COGS)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
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<td>296.000000</td>
<td>492.000000</td>
<td>216.000000</td>
<td>76.73475</td>
<td>1.266510</td>
<td>4.522007</td>
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<td>0.053530</td>
<td>0.038150</td>
<td>0.081300</td>
<td>0.006300</td>
<td>0.048052</td>
<td>0.012441</td>
<td>6.308044</td>
</tr>
<tr>
<td>G</td>
<td>0.061090</td>
<td>0.064800</td>
<td>0.070800</td>
<td>0.029100</td>
<td>0.012441</td>
<td>-1.843628</td>
<td>5.524584</td>
</tr>
<tr>
<td>NETPROFIT</td>
<td>-53.250000</td>
<td>-47.500000</td>
<td>32.000000</td>
<td>134.000000</td>
<td>57.691800</td>
<td>-0.033861</td>
<td>1.541501</td>
</tr>
<tr>
<td>R</td>
<td>0.116250</td>
<td>0.100000</td>
<td>0.190000</td>
<td>0.000000</td>
<td>0.039225</td>
<td>1.138882</td>
<td>2.705184</td>
</tr>
<tr>
<td>RF</td>
<td>0.046805</td>
<td>0.053350</td>
<td>0.085550</td>
<td>0.000000</td>
<td>0.018593</td>
<td>-0.670545</td>
<td>0.017240</td>
</tr>
<tr>
<td>SALE COST</td>
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<td>1067.5000</td>
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<td>1.703525</td>
<td>1.511252</td>
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<td>1.703525</td>
<td>1.511252</td>
</tr>
</tbody>
</table>

(source: author analysis)

Figure 2 - Cost factors stats (Admin cost)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
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<td>13.000000</td>
<td>19.400000</td>
<td>6.900000</td>
<td>4.962302</td>
<td>0.036380</td>
<td>1.451914</td>
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<td>CPI</td>
<td>0.053530</td>
<td>0.038150</td>
<td>0.081300</td>
<td>0.006300</td>
<td>0.048052</td>
<td>0.012441</td>
<td>6.308044</td>
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<tr>
<td>G</td>
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<td>0.064800</td>
<td>0.070800</td>
<td>0.029100</td>
<td>0.012441</td>
<td>-1.843628</td>
<td>5.524584</td>
</tr>
<tr>
<td>NETPROFIT</td>
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<td>-47.500000</td>
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<td>134.000000</td>
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<td>0.190000</td>
<td>0.000000</td>
<td>0.039225</td>
<td>1.138882</td>
<td>2.705184</td>
</tr>
<tr>
<td>RF</td>
<td>0.046805</td>
<td>0.053350</td>
<td>0.085550</td>
<td>0.000000</td>
<td>0.018593</td>
<td>-0.670545</td>
<td>0.017240</td>
</tr>
<tr>
<td>SALE COST</td>
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<td>3.850000</td>
<td>8.000000</td>
<td>0.000000</td>
<td>3.172889</td>
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<td>TOTALREV</td>
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<td>VINDEX</td>
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<td>351.5000</td>
<td>258.6564</td>
<td>1.703525</td>
<td>1.511252</td>
</tr>
</tbody>
</table>

(source: author analysis)

Figure 3 - Cost factors correlation (COGS)

Figure 4 - Cost factors correlation (Admin cost)
4. Main results

4.1 Technological and video camera applications for better factory monitoring

First of all, nowadays many factories have applied video cameras for monitoring factory operation. For instance:

**Figure 1 - Video camera monitoring**

(source: internet)

Using video camera can help to manage or observe working environment and prevent damages or dangers happening for workers.

Other technology applications:

Next, Dinh Tran Ngoc Huy et al (2021) show us that ICT and AI and IoTs application will affect considerably on factory and industry. For instance, AI and robots can contribute to enhance productivity while IoTs can help to record and resolve Big Data for these industries together with data protection and security solutions.

Therefore, in term of ICT, digital technology, IoTs and AI combination can have good effects on firms and business will have more chance to enhance better communications channels via email, chatbox, e-meeting and video conference with cameras and speakers, etc.

4.2 Quality management solutions

First we look at below figure:

**Figure 2 - TQM**

Nguyen Dinh Trung et al (2021) said Every people and every aspects of organization should join TQM process. - Quality team activities. Through the quality team related problems are solved and suggestions for improvement are passed on to company management.

Other benefits of applying TQM will include:

- Higher productivity.
- Enhanced market image.
- Elimination of defects and waste.
- Reduced costs and better cost management.
- Higher profitability.

4.3 Cost management issues

Overall data results

Next we look at below charts:

- CPI, net profit and COGS has negative corr. (chart 1 and chart 2)
- Lending rate, CPI and G and Admin cost has positive corr. (chart 4 and 5 and 6)

Chart 1 - CPI and COGS

(source: author analysis)
Chart 2 - COGS and net profit

(source: author analysis)

Chart 3 - COGS and Lending rate

(source: author analysis)
Chart 4 - Admin cost and Lending rate

(source: author analysis)

Chart 5 - Admin cost and CPI

(source: author analysis)
4.4 OLS Regression results

Then we make analysis of below figures:
- Lending rate and Admin cost has positive corr. (fig 5)
- Lending rate and COGS has positive corr. (fig 6)
- CPI has negative corr. But G has positive corr. With COGS (Fig 7)
- CPI, G has positive cor. With Admin cost (Fig 8)

Figure 5 - OLS 1 factor for Admin cost

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>70.27226</td>
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<td>5.100419</td>
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<td>1.132241</td>
<td>0.2903</td>
</tr>
</tbody>
</table>

(source: author analysis)

Figure 6 - OLS 1 factor for COGS

(source: author analysis)
Figure 7 - OLS 2 factors for COGS

Figure 8 - OLS 2 factors for Admin cost
Figure 9 - Multi factors affect Admin cost

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI</td>
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<td>0.6498</td>
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<tr>
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<td>47.74907</td>
<td>147.7214</td>
<td>0.323237</td>
<td>0.7560</td>
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<tr>
<td>C</td>
<td>9.312037</td>
<td>9.217260</td>
<td>1.010282</td>
<td>0.3460</td>
</tr>
</tbody>
</table>

R-squared: 0.045373, Mean dependent var 13.200000
Adjusted R-squared: -0.222235, S.D dependent var 4.962302
S.E. of regression: 5.436060, Akaike info criterion 6.458233
Sum squared resid: 210.6780, Schwarz criterion 5.763938
Log likelihood: -29.42811, F-statistic 0.181780
Durbin-Watson stat: 0.461036, Prob(F-statistic) 0.037598

(source: author analysis with Eview)

Figure 10 - External factors affect COGS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NETPROFIT</td>
<td>0.018044</td>
<td>0.017202</td>
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<tr>
<td>R</td>
<td>-21.90629</td>
<td>22.61368</td>
<td>-0.963607</td>
<td>0.3675</td>
</tr>
<tr>
<td>SALE_COST</td>
<td>1.886274</td>
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<td>6.039380</td>
<td>0.0038</td>
</tr>
<tr>
<td>TOTALREVENUE</td>
<td>0.003929</td>
<td>0.020722</td>
<td>0.189614</td>
<td>0.8588</td>
</tr>
<tr>
<td>COGS</td>
<td>-0.003717</td>
<td>0.021137</td>
<td>-0.175875</td>
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<tr>
<td>C</td>
<td>8.310976</td>
<td>2.380049</td>
<td>3.491935</td>
<td>0.0251</td>
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</tbody>
</table>

R-squared: 0.965838, Mean dependent var 13.200000
Adjusted R-squared: 0.923135, S.D dependent var 4.962302
S.E. of regression: 1.375779, Akaike info criterion 3.759626
Sum squared resid: 7.571059, Schwarz criterion 3.941177
Log likelihood: -12.79813, F-statistic 22.61756
Durbin-Watson stat: 2.831344, Prob(F-statistic) 0.004933

(source: author analysis with Eview)
Run OLS regression with Eviews gives below results:

Figure 11 - Multi factors affect COGS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
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<td>VNNINDEX</td>
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<tr>
<td>C</td>
<td>383.9666</td>
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<td>0.3752</td>
</tr>
</tbody>
</table>

R-squared: 0.430957, Mean dependent var: 308.0000
Adjusted R-squared: -0.024277, S.D. dependent var: 76.73475
S.E. of regression: 77.66052, Akaike info criterion: 11.84343
Sum squared resid: 30155.86, Schwarz criterion: 12.00072
Log likelihood: -54.24713, F-statistic: 0.946571
Durbin-Watson stat: 2.339176, Prob(F-statistic): 0.507436

(source: author analysis with Eview)

4. Discussion

During period 2011-2020:

Impacts on COGS:

Admin cost, net profit and R has negative corr. With COGS (see fig 11)

Impacts on Admin cost:

R and COGS has negative impact on Admin cost (see figure 8)
5. Conclusion

Management implications:

Because sale cost and revenue has positive effects on COGS (see fig 11), management need to control sale cost and increase revenue properly.

Beside, we need to use ICT, AI and video camera for monitoring factory operation.

Next, we consider to apply TQM as it will be A continual process of improving and enhancing customer satisfaction through a comprehensive approach of management by ensuring the participation of all the employees to deliver superior quality of product or service for long-term success.

Last but not least, firms need to adapt to regulations in which The Ministry of Construction stimulate technical requirement and quality management of construction materials and products. Also we suggest project management board and consultants to supervise inspection, take samples of materials for testing, checking materials record. If the material profile is not satisfactory, the procedure is required to remove that material from the site. If successful, conduct material testing; materials with successful test results will be tested and accepted for input materials and put into construction.

Policy implications:

Because CPI has negative impact on COGS (fig 10), we suggest not decreasing CPI (targeted) too much.

Risk Management Information System (RMIS) implications

Management can build above cost factor econometric model to assess factors affecting COGS and admin cost.

Limitation of research

We can expand our research model for other industries and other markets.

References

1. Cocca et al. (2016). Video surveillance systems to enhance occupational safety: A case study, Safety science, 84


