

LEVEL 7 ASSESSMENT SPECIFICATION

Student name:	Hui Chun Yip David	Student ID number:	1812887
Programme:	DBA		
Module:	Approaches to Research and Academic Communication		
Module code:	SBPD7001	Contribution to Overall Module Assessment (%):	100%
Lecturer:	Dr M. Cheung	Internal Verifier:	
Assignment Title:	Portfolio	Word count (or equivalent):	7,911 words
Submission deadline:	31 August 2019	Return date of provisional marks & written feedback:	30 September 2019
Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 50%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.		
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Lean implementation in China printing industry: Survive in China-US trade war

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Date: 29th August, 2019

Abstract

This paper study the lean methodology to improve the manufacturing in China print industry. Lean is came from Toyota, also is called Toyota Production System (TPS) or Toyotatism and developed in 1980. The core idea is that maximize the customer value by minimizing the waste. The goal is provided the perfect value to the customer through the value-added product or process by zero waste (non-value added). In addition, the Lean concept is less effort to reduce the waste to make higher improvement in throughput, variety and quality by lower cost. It could make the organisation greater and higher profit margin.

Printing is one of the largest industries in the China because most of the printing company is middle scale industry. In addition, the macro environment is changed. The market need faster, better and cheaper. The customisation and personalisation product is came from the market so the printing industry is also need to change in small quantity and more product range to meet customer needs. About current China-US trade war, China should suffer 1.1% decrease in employment and 1% GDP loss which are not negligible. In addition, the foreign buyer hope China manufacturing can absorb this import tax (10% - 25%). Therefore, LEAN is one of the methodology can improve the operational cost and quality in the organisation to maintain their profit and survive.

Table of Contents

1. Part 1: Literature review -----	P.4 ~ P.15
2. Part 2: Methodology -----	P.16 ~ P.23
3. Reference -----	P.24 ~ P.27
4. External link -----	P.28

Literature review

Introduction

Lean was the scientific methodology and technology to improve the performance and process with minimum the non-value adding activities to meet the customers needs in organisation. The theory of Lean should identified the waste through value stream mapping (VSM) or kaizen team. The wastes was called T-I-M-W-O-O-D which were included Transportation, Inventory, Motion, Waiting, Over-processing, Over-production and Defects. VSM method was studied the current states by gemba which was go and see by ourselves. After gemba, the team should develop the future states of same workflow to find out the gap between current states and future states. The team should use the waste identification to find out the solution to eliminate the wastes and non-valued area to improve the workflow. It could help to improve the throughout, quality, lead-time reducing, lower cost. It was very clear that almost every organisation could used the Lean methodology to improved their businesses by different requested area and different industries. Therefore, Lean is one of the powerful tool to improve in organisation. After going through the literature, it was stronger prove that Lean tools and techniques have been increased annually. In addition, most organisations transferred the Lean manufacturing to Lean management because it could be easily implementation stage rather staying in planning stage which could make the greater result. (Cristian Morosan et al 2010; Horacio et al 2011; Alessandro et al and G.D. Samarasinghe et al 2012; D. Rajenthirakumar et al 2013; J. R. Jadhav et al and Joseph 2014; Jesus 2015; Arvind et al, Chi-on et al and Sanjeev 2016; Dirk et al 2017; Dana and Muhammad et al 2018)

In China industry, the expense was on-going to increase. Four rapid increase area were basic wages increased which is around double increased past last 10 years, housing provident fund was 5% from salary, social security fund was increase 13% in 2018 and high RMB fluctuated rate in past 3 months. In these area, it should increase over 10% operation expense. Compared with East South Asia, especially Indonesia, Malaysia,

Thailand and the Philippines, their government were control the wages, low tax policy and government support strategy. In addition, the China-US trade war, the trade tariffs should be increasing 10% on Dec-15th and may be 25% (maximum). Therefore, the totally cost should increase around 20% - 35%. Therefore, China factory should be more difficult to survive for export market. Some factory planned to move their operation out of china to waive this tariffs but they need to suffer the lower efficiency and unstable policy in out of China country.

The macro environment is also changed in printing industry. In traditional industry, it was the big quantity with few job. During the market was changed in many options and many designs, the order became small batch and many different types or styles in shorten lead time. Some orders were customisation and personalisation so we should change the method to match the macro environment. Therefore, fast change overtime and standardisation were suitable for printing industry now. It is the basic concept from Lean. Lean should adapt into most China manufacturing industry to improve the business to reduce the operation cost. Just-in-time, no WIP, line balancing was the tool of Lean could be powerful to reduce the cost. (A. V. and E. P. 2013; CSIS 2016; Ilias & Roger 2019)

This studied should help the printing industry how to improve by modern business methodology to survive in this critical time of China-US trade war.

Lean

The core value of Lean was maximize customers value and wants when minimizing waste and customer unnecessary. Lean can created greater values for customer with fewer resources. The tool should understood and clear the customer value and focuses and found out the critical area to continuous increase to maximum. The ultimate case was provided the maximum customer needs and make the waste to very low ratio or our target is zero waste. The world class ratio of valued added over non value added was 3 and non-implement Lean organisation was less than 1. Therefore, the performance of Lean applied was improved over than 3 times in the workflow. Especially it was the powerful tool to take the quick-win solution to eliminate the waste and reduce the non-valued added area to improve the organisation.

For waste eliminating, we should passed the value streams mapping or flow to identify at isolated points which was processes created that less human effort, space, less capitals, less time, less defects to keep or make product and services greater, compared with original business systems. After Lean, organisation able to provide the better product or service to our customer desires by faster, better, cheaper and fast throughput times. That why the organisation and management want to apply this tools past last thirty years. (Cristian Morosan et al 2010; Horacio et al 2011; Alessandro et al and G.D. Samarasinghe et al 2012; D. Rajenthirakumar et al 2013; J. R. Jadhav et al and Joseph 2014; Jesus 2015; Arvind et al, Chi-on et al and Sanjeev 2016; Dirk et al 2017; Dana and Muhammad et al 2018)

Lean Manufacturing

Lean Manufacturing was the a continuous systematic method to eliminate of the waste ('Muda') in the manufacturing flow in the organisation. The critical idea was continuous improve like a circle loop to improve to the best situation which called the future status. In addition, Lean has also taken into overburden (is called 'Muri') and unbalance work loads (is called 'Mura') in waste created. In addition, Lean was also well defined the value which is working or job from the perspective of the customer would be willing to pay for and would consumes a product or service. It was called the Valued added (VA). Non-valued added (NVA) was defined that customer would not willing to pay for and would not consume a product or service. For example, customer released an order the book. Value added area was included paper sheeting, paper cutting, printing and blinding. These process was customer would be willing to par for the process to produce the book. If without this process, the book could not formed. However, the non-value added area was included quality inspection, defects, transportation, pre-press process, sheet layout design, and unwanted waiting and storage. These process were customer would not to par the area in book production. Therefore, Lean methodology should minimize the wastes and non-valve added area. Lean was focus on the waiting so the just in time (JIT) was the one of the critical method to reduce the waiting. Another other waste was the inspection so Lean design the error proofing (poke-yoka) and one pass to make sure the product or work

state was corrected and customer wanted. Then why Lean made sure the process to reduce the waiting and how to achieve First time through yield (FTT) tend to 100%. The core value of Lean on making customer needs value as reducing in wastes. Lean manufacturing is a management philosophy and invented by Toyota so Lean is also called Toyota Production System (TPS) and identified as "lean" only in the 1990s. The popular idea in TPS system for its identify and eliminate the seven wastes to increase the customer value and develop the kaizen team to best achieved by varying perspectives. Therefore, Toyota was developed the world's largest automaker in steady growth of Toyota. Lean can boost up Toyota to achieve successful and focus attention from small company to largest company and high profit margin and reduce the lead-time of car development. The better case in auto development spend 18 months to create a new model. It is the great history in world automaker industry. (Cristian Morosan et al 2010; Horacio et al 2011; Alessandro et al and G.D. Samarasinghe et al 2012; D. Rajenthirakumar et al 2013; J. R. Jadhav et al and Joseph 2014; Jesus 2015; Arvind et al, Chi-on et al and Sanjeev 2016; Dirk et al 2017; Dana and Muhammad et al 2018)

Value stream mapping (VSM)

Value stream mapping was the powerful methodology in lean theory for gap studied and analyzed between current state and future state. It could be mega review the system or workflow between these two state. When identified the problems in this gap, it should use the related tools to solve the problem. Normally, when the problems were solved, the workflow could be matched the future stage. However, in real case, the workflow can't easily to match the future stage after Lean improvement. Therefore, we should review the process or workflow again to find the new problem and solve it again and again every 2-3 months. Therefore, Lean is a continuous actions and concept to led the organisation and management. If whole organisation had the Lean concept and like the Lean DNA into the blood of everybody in the organisation, It became the Lean management. For VSM, Lean team should define the gap which was the improvement area current state and designing a future state which is the product or service is the process owner wanted case for the end to end workflow or series of events. In Toyota production system (TPS), it is

the workflow mapping included materials, information and using the calculation data to reflect the improvement ratio or data. It could be applied to all value chain of the target product or flow.

The following is the workflow of the VSM drawing:

- 1) Planning and preparation – We have selected the targeted product or workflow. Also, we should create the flow, defined problem statement and goal setting. It must work with top management to identify the needs and voice of customer (VOC).
- 2) Preparing the current status map (CSM) – The CSM should show the current steps, delays, and information flows required to deliver the target product or service. The following were the major steps:
 - a) Customer/ target needs
 - b) Gemba through to identify main process
 - c) Define customer's demand
 - d) Define supplier data
 - e) Fill data boxes and drawing inventory triangles
 - f) Map information flow
 - g) Determine the current state
- 3) Assess the current state value stream map in terms of creating flow by eliminating waste.
- 4) Preparing the future status map (FSM) – This FSM should show the target of the workflow. It should think the best practices of the stations or waste reduction.
- 5) Identify the gap – Compared the flow of CSM and FSM, the difference between current and future status was called the gap which was the opportunity of the improvement through the Lean tools. The kaizen team could be based on this gap to find out the best solution how to achieve our target to become the future status.

Wastes (Opportunity)

Reviewed the most literature review, waste identification was opportunity of improvement. However, we should understand clear that we could find out the solution to solve it. Therefore, I preferred to say it was the opportunity rather than wastes. The following was the major wastes identification in lean theory. Seven wastes was identified in “T-I-M-W-O-O-D”:

- 1) Transport – it identified the products moving between internal process that are not actually required to perform the processing
- 2) Inventory – it was stock which covers all components, work in process (WIP) and finished product not being processed.
- 3) Motion – it was people or equipment moving or walking more than is required to perform the processing.
- 4) Waiting – it was the waiting between each process steps and interruptions of production during shift change.
- 5) Overproduction – Production was more than customer demand.
- 6) Over Processing – It was created by poor tool or product design.
- 7) Defects – It was the effort involved in inspecting for and fixing defects.

The wastes identification let organisation easily by gemba and let the kaizen team to solve by any methods and it should be quick-fix to solve .

Gemba

In the Lean, Gemba was the term often see in the literature review. Gemba walk could find out the opportunity by Go and See. The team should identify the problem by themselves rather than listened and reported by the others. Gemba walk was one important part of operational management by managers because Gemba walk shall be done daily, even better if several times a day. Each manager must refer to the standard work for leaders as check list of items to be seen by workshop leaders, including managers. This guideline highlights some questions to find out or clarify problems which every workshop manager shall do when going through the Gemba Walk. Therefore, we should

go and see to re-visit our production current status to draw the workflow to find the gap and problem to quick-fix improve. This workflow preparation should be followed by product end to end flow. That mean the scope should be covered from customer order received until the Shipment.

Just in time (JIT)

Just-in-time was very broad and comment used in Lean theory. It was the critical method and idea to eliminate the work in process goods (WIP) because the WIP was defined the non-valued product and process. WIP reflected the process was unbalance output and WIP also extra workload to prepare to handle and storage. It was called hidden factory process. By the literature review, it found that the organization could reduce the worker, inventory area, the labour content and increase the cash flow. It could enhanced the earning. In addition, the following was advantage after JIT adoption:

(Huson and Nanda 1995; Sakakibara et al. 1997)

- (1) reduction of process setup time;
- (2) More flexibility scheduling;
- (3) Less maintenance;
- (4) More efficiency and shorten equipment layout;
- (5) Visual management by Kanban; and
- (6) Just in time supplier relationships.

It also could reflect to quality management, human resource management, strategy of manufacturing, product design and organisational structure improved. The organisation could be measured by manufacturing performance index:

- (1) Inventory area and turnover rate;
- (2) Percentages of on-time delivery;
- (3) Production lead time; and
- (4) Product end to end cycle time.

After adopt the JIT, the overall advantage was the increase the competition in the same industry because organization performance was increased such as lead time reduced, on-time delivery performance, lower inventory level, less worker. Per the survey of 41 randomly selected plants from the US-owned and the Japanese organization in Sakakibara

et al. (1997), it could showed the significant relationship between the use of JIT practices and manufacturing performance and infrastructure practices. That why JIT could improve the performance of organization.

Studied the literature review, Lean was very successful to improve the organization structure, workflow and work process. It could be find out the hidden factory and non-valued process and area to eliminate them and improve the throughput, quality, lead-time and reduce the inventory level. It could help the organisation to improve their cash flow and profit to provide the better offer or service to their customer. Normally, customer should appreciate that the organisation can provide the better service. In the critical point, Lean should like the DNA to build into their brain or blood to keep continuing to improvement. Therefore, continuing improvement was the major diver their improvement. For business improvement tool, it should not only was Lean. Six sigma is also the best tool for quality improvement. Their core value was improve the quality pass rate to 6-sigma level and make the product or service was very stable and within customer acceptable rate. Some literature review could like use six sigma with lean together so it could be Lean Six Sigma theory.

Lean Six Sigma

Six-sigma was the disciplined and methodology to eliminate the defect by data-driven approach. The defect rate was driving toward 6 sigma level from manufacturing level to transactional level and from product production to service is also useful. 6 sigma is the statistical figure to describe what is the performance of the process quantitatively. Six sigma was represent the process and product must produce less than 3.4 defects under a million opportunities (ppm). In generally, the process was applied six sigma, the sigma level could be improved to 4.5 sigma in most organisation. Before adopted six sigma, the process was 1-2 sigma level. Therefore, six sigma was the goal to let the organisation to keep continuing to achieve. Six sigma was the measurement based strategy to keep check the process and product improvement and defect reduced in project. Six sigma used the capacity process index (Cpk) to reflect the process statics. It was more scientific figure to show the process stage. The six sigma process was the DMAIC process which

included Define, Measure, Analyze, Improve and Control was the continuing improvement to meet the customer requirement or specification. It could reflect the incremental improvement by current process.

Per literature review, a thousands of adopted the six sigma companies in the world have discovered the benefits from six sigma approach. Many frameworks existed for implementing the Six Sigma methodology. It was implementing Six Sigma quality, based on the similar change management philosophies and applications of tools. During the six sigma should be the mega improvement project in the organisation, most likely should be single project in the critical process or the expensive process. In printing industry, the critical process should be pressing for improvement.

Lean Six Sigma combined the tools for improvement. Lean was focus on the variability reduction and quick-win methodology. It should applied to reduce the potential variable and faster to find out the critical parameter. It could help to increase the efficiency and reduce the six sigma project lead time. Lean could indentify the waste and non-value added elimination tools and techniques from Lean Manufacturing, to generate savings to the bottom-line of an organization. Therefore, it should be new trend for organization for suitable tool combination.

(Nicholas and Matthew 2010; Alessandro et al 2012; Arvind et al and R. Raju et al 2016)

Lean with Theory of constraints (TOC)

Theory of constraints was invented by Dr. Ellyahu Goldratt in 1980 which is a methodology to find out the limited factor or constraint to improve to achieving the goal. It was the systematic continuing improve the constraint until the limited factor is deleted. During TOC was focused on constraint, it could easily find the limited factor because the limited factor was the bottleneck of production. The Theory of Constraints was the scientific approach for improvement. It had two assumptions which were system thinking and all system should be a limited constraint when achieving higher performance as the constraint solved. If organization want to improve the process in short term and long term, it could

make the higher profit by throughput increasing by bottleneck is solved. TOC were 5 focusing steps, thinking processes and throughput accounting of this theory. In literature review, the most successful case could improve the Lean adopt organization. TOC could help to increase the profit, rapid improve, improve capacity, reduce lead time and reduce inventory. However, the powerful improvement was the bottleneck broken to increase the throughput rate. The following was the five focusing steps of TOC:

- 1) Identified the current constraint
- 2) Found the quick improvement to improve the throughput by any resources
- 3) Subordinate – reviewed all parts of the process to make sure the process was aligned and the resources could support the constraint area.
- 4) Elevated – Reviewed this constraints still here or not, it was eliminated should be better. If still here, we found another method to improve until the constraint has been broken.
- 5) Started point 1 – The constraints should be changed another part, the organization keep continuing to improve again by TOC theory.

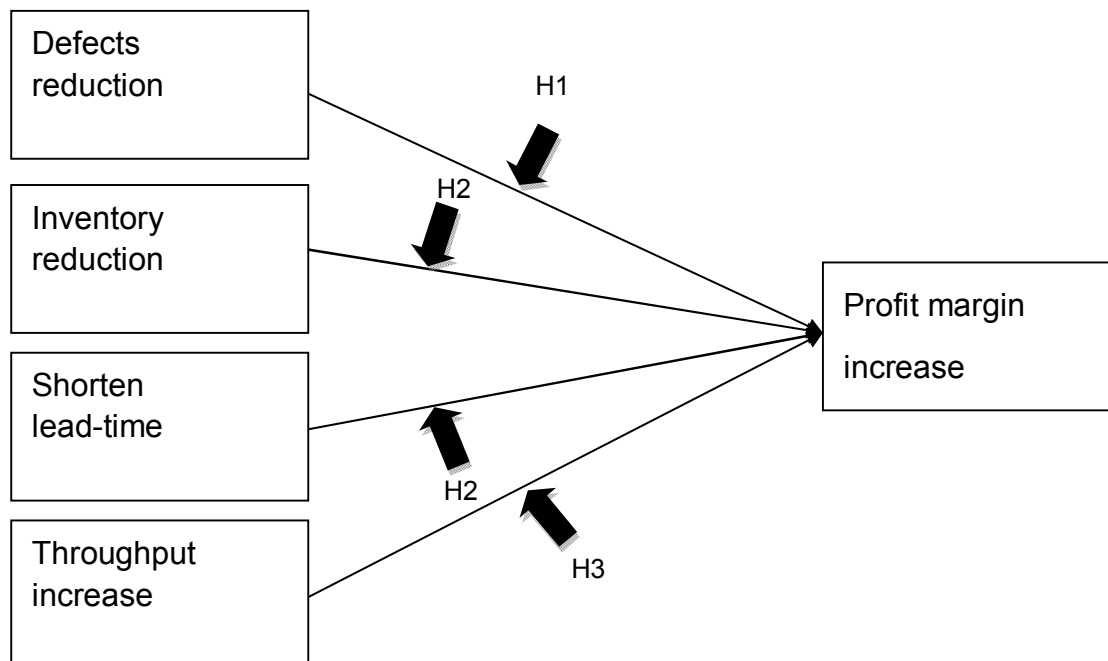
Therefore, the core concept of the Theory of Constraints believed that the process have a single constraint in every process. If the constraint could be improved and kept, the throughput should be more stable or increase. Therefore, TOC should be quick methodology to increase and focused on protect the constraints and increase throughputs. The main thing was keep continue improvement. During the first priority was the current constraints, TOC must be quickly rapid improvement However, Lean have many quick-win tools. We could combined both tools in same situation. TOC focused on the bottleneck then Lean could solve the bottleneck by Lean tools. When the current bottleneck was solved, the constraint should be moved another area. Therefore, we could keep continue to improve again until the constraint is deleted or eliminate. That why TOC should connect with Lean should be more powerful use single methodology.

Research gap

Per all literature review, the business improvement should not focus on single theory. We

could combine different methodology to solve the suitable issue. Most organisation prefer to use Lean, Six Sigma or Lean six sigma as the tool rather than technique approach because there are not clear guidelines and not mega organisation structure in Lean and Six sigma approach because the idea is not well cover in the management. In addition, the organisation should prepare the training and course to teach their employee and their supplier chain partner before the tool application. The conceptual methodology could help them to improve their working environment and workflow before the improvement. Nowadays, Lean, Six sigma are more focus on productivity increase, workflow improvement, process improvement rate and supply chain. In one journal, Shahram 2016 use the JIT to improve the performance and workflow in the China industry. During past 5 years journals, the journals should apply not only theory to solve the problem though Lean with six sigma, Lean with TOC and Lean with industry 4.0 for process improvement. In addition, the companies focused on make more profit, survive in the market and workflow improvement by defect reduction, JIT or inventory reduction, lead-time reduction and throughput increased. Therefore, we could define the research gap by methodology combined could rapid improve to meet the higher profit.

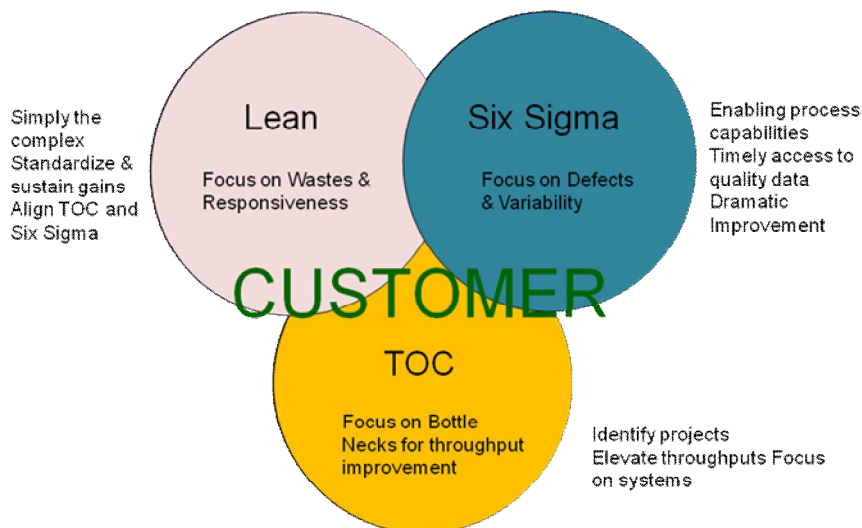
The following are the mapping in details:



H1 = Six sigma approach; H2 = Lean approach; H3 = TOC approach

In the research, we should identify these 4 elements (defect reduction, inventory reduction, Shorten lead-time and throughput increase) have the relationship to increase the profit margin in China printing industry. Therefore, most industry and company is strongly relationship with this element in literature review but most same in this case. We should take the Cronbach alpha approach to identify the relationship or not. As the relationship is confirmed, we could process the improvement.

Combined different approach, it could be rapid to improve because different approach have different benefits. TOC is strongest in rapid to find out the problem and mega review the constraint area to improve. In addition, TOC is strong in throughput increased by constraint protection. Lean is stronger in waste reduction and quick-win solution so the lead-time, waiting and WIP are well-defined in waste. JIT, Kaizen, gamba and VSM are the great methodology to reduce the waste to achieve higher valued-added approach. Six sigma is strong in defects reduction by scientific methodology which is power on the product capacity and performance to meet customer needs. Therefore, the organization could be use the Lean Six sigma integrated with TOC approach to solve 4 critical elements.



Lean six sigma approach with TOC

We also need to study the end result of the improvement between before and after stage to compare the improvement is significant or not. We could prepare the hypotheses testing to prove the improvement is valid or not in our research. If not significant, the problem should not enough strong relationship or other hidden factor may not be found.

Methodology

Per my literature review, we reviewed over 30 journals which the content is related in Lean concept and China printing industry part 10 years. Actually, this review could let me more understand how to prepare and select the better dissertation to review. In addition, we can understand the trends of this topic within five to ten years. In this part, I would like to discuss the dissertation from Shahram Tai and Cristian Morosan on 2016 and the title is the 'The impact of lean operation on the Chinese manufacturing performance'.

This paper content is about the performance after lean operations adopted in the China industry and using lean assessment data from 65 plants in different industries. In the literature review, it should be extend the Lean theory could help to improve the industry by Lean adopted because the core value of Lean concept is minimizing the waste and maximize the customer value to meet the customer requirement and needs. This journal is focus on the Just-in-time (JIT), Total quality management (TQM), Total productive management (TPM) and Human resource management (HRM) of the Lean concern area in 65 companies. In addition, the methodology is related operations practice which are human resources and supply chains, product design and operations performance. In addition, the data is came from the primary data from 65 industry interviewer. In the finding of journal, it is confirmed the significant factor of flow, flexibility and quality after lean application and it is strongly relationship in supply chain with flow and flexibility, human resources with flow and flexibility, production system design with flow, flexibility and quality and practice design with preference by Cronbach alpha and regression model. This paper is reflected the China manufacturing factory after Lean adopted but the manufacturing is in 8 fields but each fields is not equal and balance which are electronic (9 companies), telecommunication/ wireless (8 companies), pharmaceutical/ chemical (8 companies), food/ beverage (6 companies) , garment (5 companies), printing (4 companies) and petroleum (3 companies). Actually, each fields data is not equal. Therefore, the data can't reflect of each fields. Therefore, this journal should not cover the whole or major industry or service in China.

Ethical issue

This paper provided the corrected direction is that Lean adopt could improve the industry performance in manufacturing firm of China production. The paper show that Lean theory is powerful tools to improve in the different industries such as furniture and petroleum in China manufacturing firm or Lean tools such as Just-in-time (JIT) to improve the set-up time reduction, materials workflow simplifying, inventories reducing and defect preventing which is the key factor after Lean applied. The strong message from Literature review is that Lean can help to improve the industry of the world, not only in China, to make a higher profit margin or meet the customer needs. Therefore, the author study the China manufacturing firm by the Lean methodology applied. (Lawrence et al. 1995, Li 2000, Li 2005, Robb et al. and Taj 2008)

In this paper, the author could highly protect the interviewer (65 industry firms) and security of data by primary data because the paper don't disclose the company name, industry fields, company size, etc. It is very good for protect the security of interviewer. However, the paper interviews 8 industries only and no. interviewer is not unequal in each fields. During the paper was cover few industries and few interviewer, the paper could not reflect on behalf of whole China manufacturer but the paper can reflect their studied China manufacturing companies but size is 65 companies only. Actually, it is a limited size and unequal field study in China manufacturing. In my suggestion, the paper should be specified industry, which location area studied or which company size such as listed company or top 10 companies of each field. In addition, we should be focusing on target industry with related industry. For example, we should be focus on printing industry. The related company is ink supplier, paper supplier and printing machine supplier. It could interview related industry and the data could be reflect more significant. Also, the time and how to select and draw the interviewer is also important. We should define the target population , determine the sampling frame, select a sampling method, determine the sample size and how draw the sample data in the journal. If do that, this paper should be more powerful and useful to reflect the industry or location area study rather than just

higher representation on single industry. In addition, the author also can mention what is the method to protect the data such as delete all the raw data after interviewer. It should be better.

In the paper, it is focused the Lean tools of Just-in-time. Just-in-time is the major concept to reduce the waste because the company can be well apply in Just-in-time that means less setup time, flexibility scheduling, planned maintenance schedule, well equipment layout, good kanban to feedback the process owner and JIT supplier relationships. If do that the company can be lowest defects, inventory, no work-in-process inventory, line and station balancing in higher OEE rate to make higher profit margin and cash flow. Per literature review of JIT, Sakakibara et al. (1997) identified that JIT could help to company increase competitive advantage. Inman and Mehra (1997) identified the advantage of JIT could improved the company and workflow over 700 articles. Huson and Nanda (1995) identified that JIT could created the value, reduced the labour content, increased turnover of inventory and increased the earning. It could proved JIT could help the company improvement and greater result as company and customer expected.

In addition, the paper also showed that total quality management (TQM), total production management (TPM) and human resource management (HRM) to well support the Just-in-time happen in the Lean concept adopted in the interviewer company. TQM included client satisfaction, continuous improvement, team compromised with the quality idea, excellence in management and total integration in the process. Similarly, Lean like DNA involve the blood of everybody in the company to let the staff could be work with quality mindset. TPM included autonomous maintenance, planned maintenance, focused improvement, early equipment management, training & education, safety & environment, TPM administration and quality integration. HRM included attraction, selection, training, assessment and rewarding. TQM, TPM and HRM were supported JIT for manufacturing improvement in Lean adopted.

Therefore, the paper should be clearly identify Lean advantage to support the China manufacturing.

Reliability

About the reliability, the author draw the data by interviewer. Totally is interviewer company is 65 companies with 8 fields. Normally, Hong Kong is very lower feedback rate which is 7% only. The feedback rate in western country is higher such as Europe is around 30% and North America (USA/ Canada) is around 40%. The best data should be not less than 30 feedback data. If we applied in Hong Kong, we should prepare at least 430 questionnaire for interview.

About this paper, it use the cronbach alpha and p-value to determine the relationship and significant between different factors. The paper should be used the 40 questionnaires of each interviews. About the 40 questionnaires of 65 manufacturing factories, it is 3 constructs related to practice and process design. The constructs is used as the equalled number of each variables which are supply chain, human resources and production system chain. The measures are used by three and five-point Likert-type scales. In my suggestion, I suggest to apply all is five-point Likert-type scales because the statistics should be more standardize rather than three and five-type Likert-type scales. After the statistics, it should separate in 3 tables as operation performance, supply chain and human resource of operation practices and production system design. About the cronbach alpha, the supply chain of operations practices is 0.54 by 8 items, the human resource of operation practices is 0.71 by 10 items and the production system design is 0.54 by 12 items. Therefore, it is just human resource of operation practices is acceptable of cronbach alpha because the value is over 0.7. During the cronbach alpha of supply chain of operations practices and production system design are also less than 0.7, I suggest delete some items to increase the value of cronbach alpha. The more significant method should control the item number around 5 to 7 items because too much items could be easily affect the value of cronbach alpha.

In my suggestion, I suggest to remove the items of outsourcing and ratio of inventory turnover to the industry average because their mean value is 1.85 and 2.49 and their SD is

1.11 and 1.24 in the supply chain,. It could increase the cronbach over 0.7 to acceptable level. For production system design, I suggest to remove the items of facility layout (batch versus cell), cross loading and plant target operation capacity because their mean value is 1.97, 2.31 and 2.74 and their SD is 0.97, 1.21 and 1.16.

After the cronbach alpha of operation performance, supply chain and human resource of operation practices and production system design, the paper study three factor solution to improve the performance of manufacturing by the paper of literature review. This three factor solution are flow, flexibility and quality. Therefore, the author prepare the cronbach alpha again of this three factor solution. About the cronbach alpha review , the flow is 0.71 and flexibility is 0.63. Quality is the major and single items so the author don't separate the items and the mean is 3.91 and SD is 0.52. Per this data, it could conclude quality improvement is one of the important in the solution. In my suggestion, it could separate into incoming quality checking of components, incoming quality checking of raw materials, work in process quality rate, final inspection rate and defect rate to study which items should be the important items related with quality. The cronbach alpha of flow is 0.71 in the acceptable level but the flexibility is 0.63. Therefore, I suggest to delete some items in flexibility. I suggest to delete the setup time because the mean value is 2.66 and SD is 1.34. Therefore, it could improve the flexibility to acceptable of cronbach alpha when the value is over 0.7.

After review the cronbach alpha of construct and solution, the author use the p-value to test the relationship of the operations practice and design with performance. About the regression analyses to study their relationship. The author review the relationship of constructs in supply chain, human resource, and production system design with three factors derived from performance (flow, flexibility, and quality). During the higher cronbach alpha can reflect the relationship is strong, the author determine the p-value is 0.05 related with supply chain and human resources & production system design constructs is defined to p-value is 0.01. In the solution, flexibility is strongly associated with the supply chain so the author define the p-value is 0.01, human resources is 0.05 and production system design constructs is 0.01. Quality is only related with production system design so the author define the p-value is 0.05. Finally, it could be found out the relationship between each others. The relationship is (significant):

- (1) Supply chain is strongly related with Flow and Flexibility
- (2) Human resources is strongly related with Flow and Flexibility
- (3) Production system design is strongly related with Flow, Flexibility and Quality
- (4) Practice/design is strongly related with Performance

In my suggestion, the author should be show the hypothesis test formula should be better such as:

Hypothesis 1:

Ho = Without relationship between supply chain with three factor solution in Flow, Flexibility and Quality

Ha = With relationship between supply chain with three factor solution in Flow, Flexibility and Quality

Hypothesis 2:

Ho = Without relationship between human resources with three factor solution in Flow, Flexibility and Quality

Ha = With relationship between human resources with three factor solution in Flow, Flexibility and Quality

Hypothesis 3:

Ho = Without relationship between production system design with three factor solution in Flow, Flexibility and Quality

Ha = With relationship between production system design with three factor solution in Flow, Flexibility and Quality

Hypothesis 4:

(1) Ho = Without relationship between practice/design with three factor solution in Flow, Flexibility and Quality

Ha = With relationship between practice/design with three factor solution in Flow, Flexibility and Quality

If we define the hypothesis testing question, it could be more easily to under the testing direction and solution from this paper.

Validity

In this paper, the author is applied convergent validity and discriminant validity together. Convergent validity determine the related constructs as flexibility and flow that are measures. Quality is separate to study. Convergent validity could be established as similar construct. Campbell and Fiske (1959) developed the Multitrait-multimethod matrix to study the construct validity of a set measures data. When study in the new testing, it should be importance as using validation of both discriminant and convergent together. Discriminant validity determine the constructs should not be similar and lower correlations of each variable in the organisation.

For convergent validity, two constructs is related with supply chain construct and human resources construct in operations practice. The supply chain have 8 related items and human resources have 10 related items. For discriminant validity, it applied in quality with and product/ practices design. It is different with another constructs.

Jayram et al. (2008) applied convergent validity because the paper studied the relationship between relationship building with suppliers and customers and lean strategy and financial performance. Suppliers and customers are close relationship in developing in lean strategy of this paper. It consider both aspect in strategy, product design, manufacturing by lean methodology such as JIT production, setup time reduction and cell production.

In my point of view, I agree that the author apply both validation of discriminant and convergent together in different situation that it should be better and make sure the validation is more focusing. If I prepare the dissertation, I also apply one more method of criterion validity because which can test the relationship between the scores on a particular measure and performance on a second measure. I should make sure the lean methodology can adopt and valid. Before Lean and after lean should be great different and Lean methodology could be keep continuing efficiency is also need to do. Therefore, validity is necessary to prove the data is valid.

Conclusion

In conclusion, after our review these journals and deeply review this journals. We could understand how to prepare the literature review, select and comment the journals. About this paper, it is better to understand this dissertation about the Lean adopted and extension in China manufacturing firm. In addition, this paper focused on the Just-in-time as the core to reduce the waste and great improvement. In addition, it also found out the significant by Cronbach alpha to support the relationship area. The paper could be protected the interviewer.

However, the paper don't enough the interviewers (65 companies) and times of each construct is too much (8-12) and suggest to control no. of interviewers and items each construct and specified which industry or field. It could not well to cover in China manufacturing. In addition, the paper don't identify to prepare the hypothesis test. Some literature review Actually, the paper is quite good for me to learn how to prepare the dissertation in future.

Per our further literature review, we found that the paper should combine the related tool. Alessandro et al. (2012), R. Raju et al. (2016) and Ercan et al. (2018) should combine the tool for improvement such as Lean with Six sigma, Lean with TOC, Lean with Industry 4.0. It is because we should use the suitable tool for business or process improvement. During Lean, Six sigma, TOC and Industry 4.0 are difficult approach but the core idea is also same for improvement. The main core of Lean was waste reduction, the main core of Six sigma was quality improvement, the main core of TOC was throughout improvement by eliminate the constraint (bottleneck). Therefore, I would like to use the combined concept approach as Lean Six sigma integrated with TOC in my further review and dissertation,.

During the China and US trade war, China manufacturing move their operation outside of China or improvement their operation cost for survive. In addition, China company also

need to face the labour shortage, higher benefits and cost increasing issue. Therefore, I would like to prepare the dissertation for improve in China printing industry.

My target for business improvement is ABC Group which is a professional paper-based items manufacturing and printing company. ABC is the turn-key service provider on paper product and printing manufacturing. The headquarter of ABC is in Hong Kong and manufacturing site is in China and Vietnam. The skilful worker is around 4000 peoples. The main product line are game set, board games, puzzles, greeting cards, educational products, luxury packaging boxes and reading books. During the world market and environment is nor stable, ABC need to look lower cost operation method to survive.

Finally, I should say thank you to UWTSD and HKMA because I could study in the program which is my 4th course of DBA. Actually, this program enrich my research skills, wider strategy skills and academic communications. Therefore, I would like to use my learning from UWTSD and HKMA to improve ABC group company.

I hope ABC, UWTSE and HKMA could be more success.

Reference

1. Alessandro Laureani, Malcolm Brady and Jiju Antony (2012) 'Application of lean six sigma in an Irish hospital'
2. Anders Johanssona, Linn G. Christierninb and Lars Pejrydc (2016) 'Manufacturing system design for business value, a holistic design approach'
3. Arvind Upadhyay, Jose A. Garza-Reyes, Luis Rocha-Lona, Nashmi Chugani and Vikas Kumar (2016) 'Investigation the green impact of lean, six sigma and lean six sigma'
4. A. V. Melnikova and E. P. Semenyukb (2013) 'The information revolution and the modern printing industry'
5. Chi On Chan and Huay Ling Tay (2016) 'Combining lean tools application in kaizen: a field study on the printing industry'
6. Cristian Morosan and Shahram Taj (2010) 'The impact of lean operations on the Chinese manufacturing performance'
7. CSIS (2016) 'Made in China 2025'
8. Dana R Troutman (2018) 'Integrating digital design technologies and lean manufacturing to meet aerospace organizational needs and improve performance'
9. Dirk Pons, Venkateswarlu Pulakanam and Zuliyanti H. A. Azyan (2017) 'Success factors and barriers to implementing lean in the printing industry'
10. D. Rajenthirakumar, R. Sridhar, K. S. Janani (2013) 'Measuring the impact of lean tools in a printing machinery manufacturing company'
11. Ercan Oztemel and Samet Gursev (2018) 'Literature review of Industry 4.0 and related technologies'
12. G.D. Samarasinghe, H.S.C. Perera and S.K.P.N. Silva (2012) 'Viability of lean manufacturing tools and techniques in the apparel industry in Sri Lanka'
13. Helen E. Cherry (2012) 'Exploring lean production through the diffusion of innovation: development of a new implementation effectiveness index'

14. Horacio S. Meier, Jose A. Garza-Reyes, Paul L. Forrester and Sibi Markose (2011) 'The role of the physical layout in the implementation of lean management initiatives'
15. Ilias Kapoutsis & Roger Volkema (2019) 'Hard-core Toughie: Donald Trump's Negotiations for the United States presidency'
16. Jesus Arroyo (2015) 'The relationship between organization culture and lean implementation in the aerospace industry'
17. J. R. Jadhav, S. B. Rane and S. S. Mantha (2014) 'Roadmap for lean implementation in Indian automotive component manufacturing industry: comparative study of UNIDO model and ISM model'
18. Joseph H. Pentlicki (2014) 'Barriers and success strategies for sustainable lean manufacturing implementation: A qualitative case study'
19. Kipphan, Helmut. (2011) 'Handbook of print media: technologies and production methods. Springer'
20. Lewlyn L.R. Rodrigues and Nagaraj Kamath H.(2016) 'TPM leading to total production management'
21. Liang N. Ming (2015) 'On the way to "Industry 4.0"'
22. Martin H. Heinemeyer (2011) 'Where is China heading? An analysis of China's foreign policy and how it affects the Western world'
23. Michael Hammer (2011) 'Faster Cheaper Better'
24. Muhammad Ahmad, Sehrish Butt and Zeeshan A. Khan (2018) 'Implementation of lean practices in banks: A qualitative research'
25. Nicholas Roth and Matthew Franchetti (2010) 'Process improvement for printing operations through the DMAIC Lean six sigma approach'
26. Oxford Analytica (2013) 'South-east Asia: Competitiveness faces rising risks'
27. R. Raju and V. Raja Sreedharan (2016) 'A systematic literature review of Lean Six Sigma in different industries'
28. Sakakibara S., Flynn B.B., Schroeder, R.G. and Morris, W.T. (1997) 'The impact of just-in-time manufacturing and its infrastructure on manufacturing performance', *Management science*, 43 (9), pp 1246-1257

29. Salin Kumar, Sanjeev Kumar and Rakesh Kumar (2017) 'Challenges of resources in press section for sheet-fed offset printers in counter magnet city Hisar, Haryana (India)'
30. Sanjeev Shrivastava and Shrivastava R.L. (2016) 'A systematic literature review on green manufacturing concepts in cement industries'
31. Terence Tai L.C. & Li X.Y. (2019) 'Understanding China-US trade war: causes, economic impact, and the worst-case scenario'
32. Thomas S. Woodson (2015) '3D Printing for sustainable industrial transformation'
33. Wayne M. Morrison (2018) 'China's economic rise: history, trends, challenges, and implications for the United States'
34. Wen-Hsien Tsai and Shang-Yu Lai (2018) 'Green production planning and control model with ABC under industry 4.0 for the paper industry'

External link

1. http://en.wikipedia.org/wiki/Lean_Six_Sigma
2. <http://www.lean.org/WhatsLean/>



LEVEL 7 ASSESSMENT SPECIFICATION

Student name:..	Hui Chun Yip David..	Student ID number:..	1812887..
Programme:..	DBA..		
Module:..	Approaches to Research and Academic Communication..		
Module code:..	SBPD7001..	Contribution to Overall Module Assessment (%):..	100%..
Lecturer:..	Dr M. Cheung..	Internal Verifier:..	..
Assignment Title:..	PowerPoint Presentation..	Word count (or equivalent):..	..
Submission deadline:..	31 August 2019..	Return date of provisional marks & written feedback:..	30 September 2019..



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SBPD7001 – Presentation

Lean implementation in China printing industry: Survive in China-US trade war

David Hui
18th Aug, 2019

Why organisation need Lean?

Non-value added

- Waste reduction
- Lead time reduction
- Defect reduction

Value added

- Efficiency increase
- Throughput increase
- Pass rate increase



The impact of lean operations on the Chinese manufacturing performance



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Abstract

Purpose – The purpose of this paper is to investigate the impact of lean operations practice and design on the Chinese manufacturing performance, using lean assessment data from 65 plants in various industries.

Design/methodology/approach – Exploratory factor and regression analyses are used to examine the associations among operations practice, production design, and operations performance. Three constructs are developed, two for operations practice (human resources and supply chains) and one for production design.

Findings – Factor analysis shows that three factors are sufficient to represent the lean performance dimensions of flow, flexibility, and quality. Regression analysis shows that the lean performance factors are strongly related to operations practice and production system design. Using lean factors and operations practice/design, our results indicate significant gaps in lean manufacturing practices among different industries, with the petroleum and hi-tech industries performing relatively best. In addition, the garment industry performs very well in flexibility, indicating it does not compete just on price, but also on rapid response. Finally, all industries perform well in quality, underlining the emerging economy character of China. These results support other recent findings of the positive impact of lean operations on the performance of the Chinese manufacturing sector.

Research limitations/implications – The paper's findings, which are based on the experience of selected manufacturing plants in China, should not be interpreted as indicative of the characteristics of the Chinese manufacturing plants in general.

Originality/value – This paper advances the evidence on the role of lean manufacturing in two ways. First, to derive more robust statistical results, the paper relies on primary lean assessment data, as opposed to secondary opinion survey data common to most other studies. Second, to obtain more general findings, the paper makes use of a wider set of relevant variables, both for assessing manufacturing practice and performance, than is usual in the literature.

Literature review

LEAN



- Toyota Production System (TPS) or called : Toyotism in 1980
- Core idea is to maximize **customer value** while minimizing waste
- Goal provide perfect value to the customer through a perfect value creation process that has **zero waste**
- **Less human effort, less space, less capital, and less time** to make products and services at far less costs and with much fewer defects
- **High variety, high quality, low cost, and with very fast** throughput times
- Information management becomes much simpler and more accurate.

Literature review

LEAN: Just-in-time (JIT)



- Inman and Mehra (1990) identify over 700 articles written between 1985 and 1990.
- Huson and Nanda (1995) identify JIT could created the value of firm
- Huson and Nanda (1995) identify JIT could reduced the labour content in facilities, increased inventory turnover, and enhanced earnings.
- Sakakibara et al. (1997) study the impact of JIT manufacturing and increase the competitive advantage.
- They identify six JIT practices:
 - (1) setup time reduction;
 - (2) scheduling flexibility;
 - (3) maintenance;
 - (4) equipment layout;
 - (5) Kanban;
 - (6) JIT supplier relationships.

Literature review

LEAN: Total quality management (TQM)



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Literature review

LEAN: Total productive management (TPM)



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- TPM was developed in the 1960s
- Consists of 5S as a foundation
- 8 supporting activities
- Overall Equipment Effectiveness (OEE)
- $OEE = Availability \times Performance \times Quality$
 - 100% = perfect ; 85% = world class; 60% = fairly for discrete factory;
 - 40% without TPM or lean programs factory

Literature review

LEAN: Human resource management (HRM)



Win-win

**Assessment by
smart idea**

Well training plan

**Find the suitable people/
potential people**

How to attraction?

Well recruitment planning

Literature review

Cases in different industry improvement



Author	Year	Industry / country	Core study
Lawrence & Hottenstein	1995	Mexico	• investigate the relationship between JIT manufacturing • consider reducing setup times, reducing production lot sizes, simplifying materials flow and handling, reducing inventories, and preventing defective products from being made as key components of JIT.
Li	2000	Chinese factory	•investigates the relationship between such measures of performance as sales, profits (after tax), and returns on investments. •42 measures of competency in marketing, product design/development, manufacturing &human resources

Literature review

Cases in different industry improvement



Author	Year	Industry / country	Core study
Li	2005	Chinese factory	• investigates the intermediate infrastructural manufacturing decisions that affect Chinese firms' market performance. • suggests to manufacturing control, human resource development and technology applications to improve market performance.
Robb et al.	2008	Chinese furniture industry	• investigate the supply chains, operations practices and performance. • multi-dimensional construct for market performance. • 68 variables related to supply chain/operations practice and 13 operations dimensions assessed twice, once for importance and once for performance.

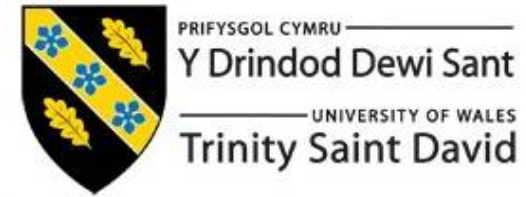
Literature review

Cases in different industry improvement



Author	Year	Industry / country	Core study
Taj	2008	Applied Lean Chinese factory	• investigates the adaptation of lean manufacturing in China. • study Lean manufacturing assessment at 65 manufacturing plants in various industries. • findings show low scores in layout design, volume/mix flexibility, setup, visual factory, and point-of-use delivery. • plants get better results as - materials flow, - scheduling control, - on-time delivery of finished goods, - overall defect rate.

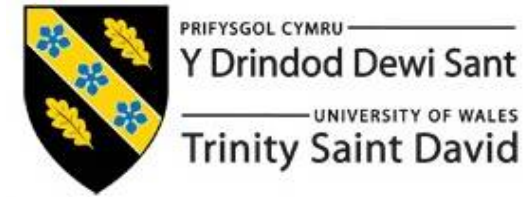
Research gap



While there are different interpretations of the nature of lean manufacturing (Womack et al., 1990; Liker, 2004; Flinchbaugh and Carlino, 2006), there is wide agreement that it originates from the so-called Toyota Production System. At the same time, some credit should be given to Henry Ford's moving assembly line, since Toyota benchmarked Ford's after the Second World War. Several authors have spent substantial amounts of time studying Toyota (Liker, 2004) and a few have tried to decode the DNA of its production system (Spear and Bowen, 1999). Based on the existing definitions in the literature (Monden, 1983; Sakakibara et al., 1997; Cua et al., 2001; Shah and Ward, 2003; Jayram et al., 2008), we can define lean manufacturing for the purposes of this study as:

A multi-dimensional approach that consists of production with minimum amount of waste (JIT), continuous and uninterrupted production flow (Cellular Layout), well-maintained equipment (TPM), well-established quality system (TQM), and well-trained and empowered work force (HRM) that has positive impact on operations/competitive performance (quality, cost, fast response, and flexibility).

Methodology



Data collection

Production assessment is a good tool to investigate the current state of manufacturing practices and performance, needed to determine the departures from the ideal state.

Taj (2008) applies a lean assessment tool to 65 manufacturing facilities in China. This is a 40-questionnaire assessment that evaluates lean operations practice and operations performance

Lee (2004). This assessment covers all dimensions in our definition of lean manufacturing. In 2004, a total of 91 manufacturing plants from various industries operating in different geographic regions of China were contacted and asked to conduct a lean assessment at their facilities. A total of 65 manufacturing plants returned the completed questionnaires, response rate of 71%.

The reason for the good response rate was the ease of use of the assessment tool and the immediate feedback promised to executives upon completion of the questionnaires. The respondents were high-level managers in those manufacturing plants.

Methodology



In this paper,

- 40 questions from assessment of 65 manufacturing facilities and group them into lean performance dimensions.
- 3 constructs related to practice and process design. Each construct is determined as the equally weighted sum of the component variables.
- show the performance dimensions and three constructs:
 - supply chain
 - human resources
 - production system design
- three and five-point Likert-type scales.

Result



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	Mean	SD
1. Product-mix flexibility	3.80	1.26
2. Production volume flexibility	3.52	1.34
3. Plant uptime	3.32	1.21
4. Housekeeping/appearance of the plant	3.89	1.21
5. Visual factory	3.52	1.29
6. Direct flow of material/purchased items to the point of use	2.82	1.18
7. Setup time	2.66	1.34
8. Overall defect rate	3.91	0.52
9. Direct flow among operations	3.74	1.09
10. On-time delivery	3.74	1.24

Result



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	Mean	SD
<i>Supply chain</i> ($\alpha = 0.54$ and $n = 8$)		
1. Middle and upper managers' knowledge about inventory	3.02	1.15
2. Inventory turnover	2.89	1.21
3. Ratio of inventory turnover to the industry average	2.49	1.24
4. Materials movement	3.74	1.40
5. Average number of suppliers for each raw material or purchased item	2.85	1.34
6. Outsourcing	1.85	1.11
7. Incoming inspection	3.23	1.27
8. Delivery frequency	2.98	1.11
<i>Human resources</i> ($\alpha = 0.71$ and $n = 10$)		
1. Organizational type	3.02	1.24
2. Compensation	3.78	1.40
3. Job security	3.68	1.59
4. Annual personnel turnover	3.35	1.04
5. Teambuilding training	3.14	1.56
6. Membership in work teams, quality teams, or problem-solving teams	2.89	1.25
7. Rapid setup training	4.06	1.25
8. Measuring managers and workers on setup performance	3.34	1.60
9. SPC training	2.35	1.12
10. SPC by operators as opposed by specialists	3.14	1.36

Result



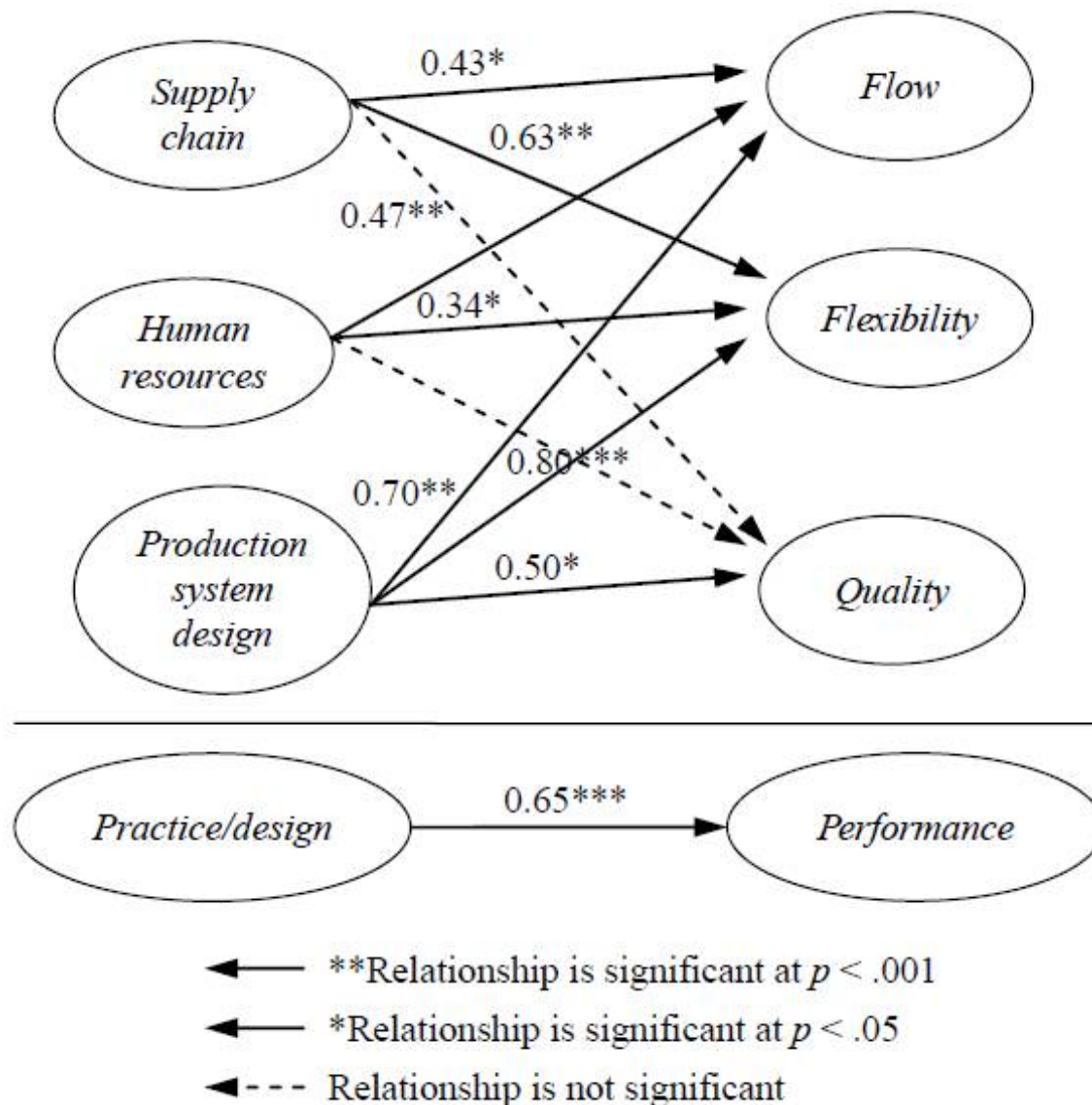
	Mean	SD
<i>Production system design ($\alpha = 0.54$ and $n = 12$)</i>		
1. Cross loading	2.31	1.21
2. Plant's process selection with respect to scale	3.12	1.27
3. Plant target operating capacity	2.74	1.06
4. Plant's process selection with respect to technology level	3.42	1.16
5. Record keeping for equipments' breakdown, repairs, and uptime	3.62	1.27
6. Equipments' breakdown and repairs	3.78	1.02
7. Preventive maintenance	3.74	1.27
8. Equipments' breakdown causing production interruption	3.09	0.65
9. Space used for storage and material handling	3.38	1.07
10. Facility layout (batch versus cell)	1.97	0.97
11. Production quality control (SPC)	3.46	1.37
12. Scheduling control using Kanban	3.05	1.36

Result

Construct	Items	Mean	SD	Factor loadings			Cumulative variance explained
Flow (Cronbach's $\alpha = 0.71$)	Visual factory	3.52	1.29	<i>0.835</i>	0.065	0.155	0.222
	Direct flow of material/ purchased items to the point of use	2.82	1.18	<i>0.603</i>	-0.074	-0.265	
	Direct flow among operations	3.74	1.09	<i>0.764</i>	0.016	-0.025	
	On-time delivery	3.74	1.24	<i>0.661</i>	0.427	0.216	
Flexibility (Cronbach's $\alpha = 0.63$)	Product-mix flexibility	3.80	1.26	-0.059	<i>0.539</i>	-0.037	0.437
	Production volume flexibility	3.52	1.34	0.035	<i>0.728</i>	-0.202	
	Plant uptime	3.32	1.21	0.203	<i>0.503</i>	0.272	
	Housekeeping/appearance of the plant	3.89	1.21	0.285	<i>0.627</i>	0.000	
Quality	Setup time	2.66	1.34	-0.105	<i>0.698</i>	0.296	0.553
	Quality	3.91	0.52	-0.006	-0.010	<i>0.903</i>	

Notes: Three-factor solution; varimax rotation

Conclusion



Relationship (significant):

(1) Supply chain

-> Flow + Flexibility

(2) Human resources

-> Flow + Flexibility

(3) Production system design

-> Flow + Flexibility
+ Quality

(4) Practice/design

-> Performance

Comment



Good:

- (1) Using JIT (one of LEAN tool) to find out the relationship and improve
- (2) Using the Cronbach's alpha to identify the relationship\ Easily understand this dissertation

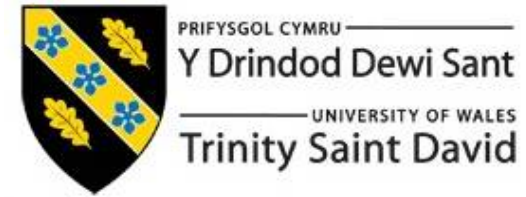
Suggest to improvement area:

- (1) Limited interviewer (65 companies) in 8 fields (not related)
- (2) Not clear to identify the prepare the hypothesis testing
- (3) Suggest to compare another tools to improve because more literature review will compare different tools to improve different situation case

Other literature review

Theory of constraints

- Invented by Dr. Ellyahu Goldratt in 1980
- The Theory of Constraints (TOC) is an emerging philosophy that rests on two assumptions:
 - (1) **system thinking** and
 - (2) if a constraint is anything that **limits a system from achieving higher performance** versus its goal, then every system must have **at least one constraints**
- Recognition of the existence of constraints represents an excellent opportunity for improvement because it allows one to **focus** ones efforts in most productive area – identifying and **managing the constraints**.



Other literature review

Six sigma

- Developed by Motorola in 1986
- Data-driven approach and methodology for eliminating defects (driving toward 6σ in any process)
- To achieve Six Sigma, a process must not produce more than 3.4 defects per million opportunities
- Six sigma methodology use DMAIC process (Define, Measure, Analyze, Improve, Control) as an improvement system for existing processes falling below specification and looking for incremental improvement
- Six sigma use process capability index (Cpk) for judgment the process is improved
- Thousands of companies around the world have discovered the far reaching benefits of Six Sigma



Other literature review for improvement

◆ Lean Six Sigma

- => Lean + Six sigma
- => Lean is waste reduction
- => Six sigma is quality improvement



◆ Lean + TOC

- => Lean + TOC
- => Lean is waste reduction
- => TOC is throughput/production increase

China environment challenges

Operation cost challenges

- 1) Increase in wages
 - >90% within 10 years
 - 12% in 2018, i.e. RMB1,530 -> 1,720
 - Cost increase in 2018 = ~RMB 20 millions
- 2) Housing provident fund
 - 5% ↑ of salary
 - Implemented in 2014
 - In accordance to wage increment
- 3) Social security
 - Based on minimum wages
 - 13% ↑
 - Cost increase in 2018 = ~RMB 3 millions
- 4) High RMB fluctuated rate
 - RMB rate is fluctuated in past 3 months
 - Difficult to forecast and control the cost
 - Cost increase in 2015 = ~RMB 3 millions



Overall direct cost
10% ↑

China environment challenges



Cost challenges

- Market situation don't allow price increase since 2011
- Two possible approaches to deal with situation:
 - i) Request customer to accept substitution of materials lower specifications in using of surface treatment:
Varnishing, Flitter, Foil, Paper stock, etc.
 - ii) Efficiency increase
 - Process automation
 - Workflow reduction
 - Wastage reduction drive e.g. ↓ less re-work & reject, first time through yield (FTT) throughout enhancement

China environment challenges

China US trade war



- +15% : Import tariffs on the China printing import materials on Sept-1st
- + 25% : When? (uncertainty issue)



Target company background



About ABC Group

- ◆ Since 1982
- ◆ Turn-key service provider on printing and paper based product manufacturing
- ◆ On-line and customization production sale by internet
- ◆ Headquarter in HK with two production bases in Dongguan & Heshan and new production site is in Vietnam (under construction)
- ◆ Greetings, board games & card games, luxury packaging items
- ◆ Skilled workforce of over 3,000 peoples



Research direction



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Research direction

Lean -> Focus on Wastes & Responsiveness

Simply the complex Standardize & sustain gains
Align TOC and Six Sigma

Six Sigma -> Focus on Defects & Variability

Enabling process capabilities
Timely access to quality data
Dramatic Improvement

TOC -> Focus on Bottle Necks for throughput improvement

Identify projects
Elevate throughputs focus on systems

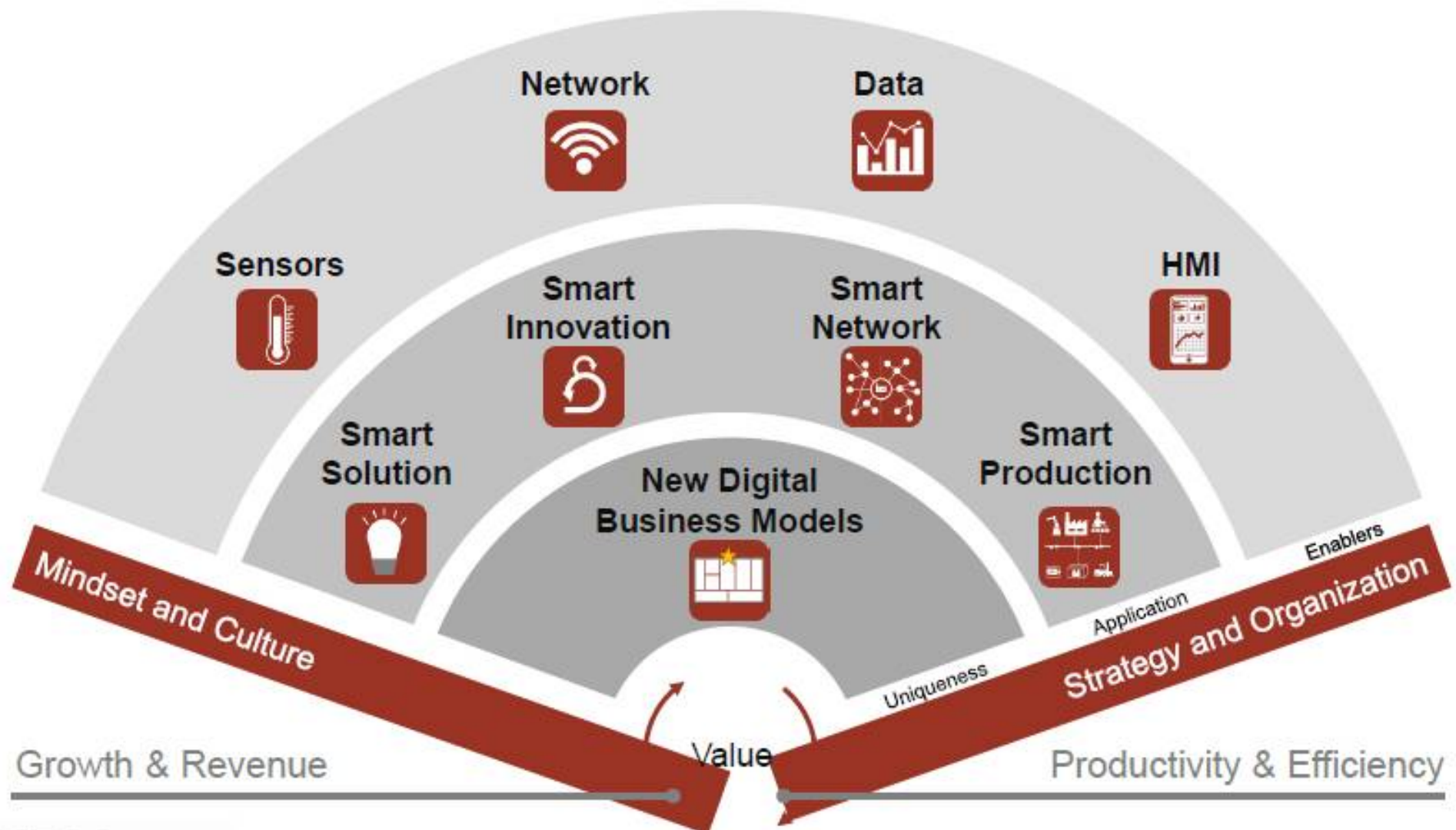
Another direction: Industry 4.0



Platform Industrie 4.0:

„The Term Industrie 4.0 stands for the fourth industrial revolution. Best understood as **a new level of organization and control** over the entire value chain of the **life cycle of products**, it is geared towards increasingly individualized customer requirements. (...) The basis for the fourth industrial revolution is the **availability of all relevant information** in real time by **connecting all instances** involved in the value chain. The ability to derive the optimal value-added flow at any time from the data is also vital. The connection of people, things and systems creates dynamic, self-organizing, real-time optimized value-added connections within and across companies. (...)”

Industry 4.0



Thank you!