

3.5.3 Database design

The purpose of a database is to organise and document case study findings, in a separate volume from the case report. This enhances the ability of the researcher to analyse data and report the findings, allows access to the raw data for independent analysis purposes, and increases the reliability of the study (Leedy, 1997:78; Yin, 2003:101, 102). It is suggested that databases be computer driven, and to take care when collecting data so that it is complete and legible for easy entry into the database (Leedy, 1978:79). The main report can site data in the database for easy referral and independent analysis (Yin, 2003:105).

This research project uses Microsoft Access and Mindjet Mind Manager for its database software. The database helps to manage more than 700 pieces of evidence selected for final use and allows for easier analysis and comprehension.

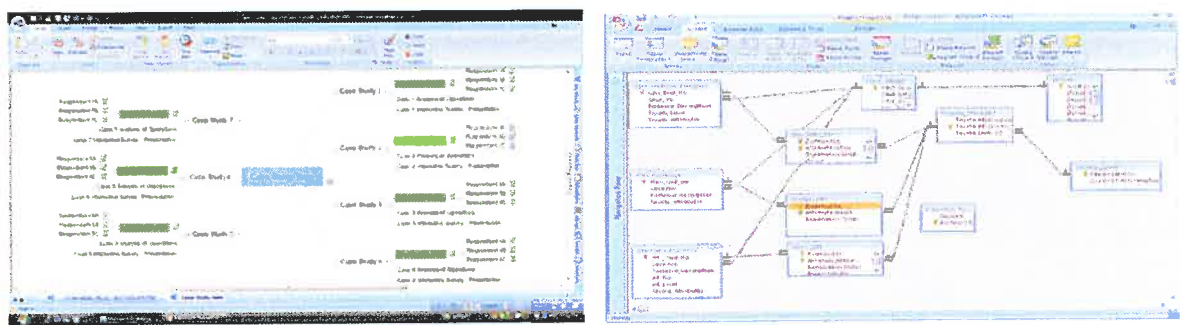


Figure 3-2: Semi-Exploded Database in Mindjet Mind Manager and Microsoft Access

The database stores the data per case study, and is further organised according to the sources of evidence. It allows multiple views e.g. either from a case or strategy perspective.

3.5.4 Pilot case study

The pilot case study is used to inform and mature the research design. Therefore, it is best to choose a study that is suitable and handy for this purpose. The pilot case can be used to further develop the research questions, hypotheses, information gathering protocol and inform the literature study. It is suggested to carefully note changes to the research design and field procedures that the pilot case suggests (Yin, 2003:79, 80).

This project uses case one as a pilot case to inform the research design and methodology.

Influence of the pilot case on the data collection techniques

The pilot case gave insight on how to complement the interactive presentation with additional sources of evidence, and showed how various sources of evidence could be approached for possible triangulation. It also confirmed the interactive presentation as a data-gathering technique.

Modification of the theoretical framework

The framework capturing the fundamental nature of the TPS itself did not require modification, but data gathering approach was augmented with additional sources of evidence.

Inclusion of the pilot case as part of the research

After modifying the research question, literature study and corresponding research, the pilot case was revisited to gather additional information in line with the matured case study protocol (i.e. interviews and structured observations).

3.6 Conclusion

This chapter explained the research strategy, design, methodology and preparation. The purpose of this dissertation is to establish how prevalent the fundamental nature of the TPS is in selected South African organisations. It follows an embedded design with twelve sub-units being studied. The unit of analysis is selected South African organisations, constituting a multiple case approach. Differing competitive dimensions and positions on the product process matrix are used to select the cases for the study. To ensure an ethical approach, no attempt is made to influence participants. In addition, anonymity, a detailed protocol and care to cite all contributions aims to further safeguard this report. Validity and reliability are addressed, in part, through studying the prevalence of the fundamental nature of the TPS at seven cases in a highly structured approach. The techniques and approaches to working with the data that this study collects were discussed, including the approach followed to link the data to the hypotheses, the structure for interpreting the findings, and the logic behind the report format. Case preparation included the development of a case study protocol and database. A pilot case was conducted and influenced the research design in maturing the data collection techniques. Appendix D, G and H provides detailed data collected and the approach followed. The next chapter provides results of the study.

4 Results

Chapter four explores the data collected through the research strategy and data gathering approach discussed in the previous chapter. Discussion of results start with an analysis of case two to provide insight into how data analysis is done; lists results for the remaining cases and concludes with a comparison of the original selection criteria and the outcome of the results.

The aim of chapter four is to summarise the results in order to answer the main research question: How prevalent is the fundamental nature of the TPS in selected South African organisations? The main hypothesis is that the fundamental nature of the TPS will be found in all selected manufacturing organisations (i.e. case one, three, four, six and seven), and by implication not at the selected service organisations (i.e. case two and five).

This dissertation interprets the statement 'will be found' to imply full compliance, i.e. evidence should indicate the presence of the fundamental nature of TPS in its entirety. This implies that some evidence will be found for all the activities^{xiv} that inform the fundamental nature or strategies of the TPS. The main hypothesis is broken down into sub-hypotheses, with the same argument for each strategy of the TPS -

- some evidence will be found for all the activities that inform a particular TPS strategy at the selected manufacturing organisations (literal replication); and,
- no evidence will be found for any of the activities that inform a particular TPS strategy at the selected service organisations (theoretical replication).

Given this interpretation, results are generally organised per case and per strategy, with sub-headings for each activity. This allows a conclusion regarding the presence or absence of an activity which informs the presence or absence of the strategies or fundamental nature of the TPS.

4.1 Individual case results (activities and strategies): case two

Case two is selected for presentation in the main document. Evidence found for case two is presented according to the twelve strategies and 48 activities set forth in the literature study. Each time, a brief summary from the literature is quoted to remind the reader of the activities presented.

^{xiv} This dissertation interpreted the fundamental nature of the TPS as the strategies of the TPS, or TPS Level One. However, the presence or absence of the strategies of the TPS is informed by measuring the presence or absence of a lower level, i.e. TPS Level Zero or the activities of the TPS. For more information on this particular aspect of the theoretical framework, see section 2.5.4.

When evidence is quoted, a 'P-', 'P-', 'I-' or 'O-' with a number following will be seen. 'P-' represents evidence from the interactive presentation feedback, 'I-' represents evidence from the interviews and 'O-' represents evidence from the structured observations. The number following each dash represents the unique number for that piece of evidence as used in the database.

Tables are used to summarise the data at the end of each section. As explained in chapter three, this dissertation regards an activity as being performed when some evidence is found to support that activity, i.e. when any of the potential descriptions in the literature study is found. Whenever this is the case, an 'S' will be indicated next to that activity; with an 'N' indicated if no evidence was found.

The evidence is presented according to the twelve strategies of the fundamental nature of the TPS:

4.1.1 Increase customer value

'Increasing customer value' for the purposes of this study is summarised according to four activities. The first is having a deep understanding of what the customer perceives as value (Bicheno, 2004:10; Womack and Jones, 2003:10,16,19), which includes using personal relationships as a vehicle to understand what the customer really values (Liker, 2004:177). The second activity is a discipline of rethinking core products to deliver upon what the customer views as valuable (Womack and Jones, 2003:32; Ballé and Ballé, 2005:28). The third activity is to scrutinise steps along the process to ensure maximum value add, or what the customer wants, as opposed to wasteful or unnecessary activities from the customer's perspective (Womack and Jones, 2003:97; Ballé and Ballé, 2005:85). Lastly value needs to be added to the customer throughout the lifecycle of the product (Liker and Hoseus, 2008:497, 498).

The following paragraphs summarise evidence of similar activities at case two:

Understand the customer's perspective of value

Case two showed a sensitivity towards delivery reliability (case two: P-79), customer satisfaction (case two: P-9), and that they needed to be in touch with what the customer perceives as value (case two: P-16, P-233, P-261, P-72). Relationships were used as a method to understand what the customer values (case two: I-26; P-226, P-51, P-44, P-65).

Re-engineer core products to improve customer value

No evidence was found that suggested re-engineering of core products to improve customer value.

Redefine organisation processes to increase customer value

Redefining of processes to deliver customer value seems to be limited to an awareness of aspects that the customer is not willing to pay for (case two:I-21; case five:P-41).

Add value to the customer throughout the lifecycle of the product

No evidence was found that suggested a lifecycle long approach to add value to the customer.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-1: Summary of 'Increase customer value' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Understand the customer's perspective of value. (S)	▪ Set up a value-stream in every major market.	×
	▪ Define value jointly with the customer around cost, quality, delivery and overall specification.	×
	▪ Ensure a general sensitivity and awareness regarding customer needs and satisfaction throughout the organisation.	✓
	▪ Use personal relationships as an approach to understand what the customer really values.	✓
Re-engineer core products to improve customer value. (N)	▪ Rethink core products after obtaining an improved understanding of customer requirements.	×
	▪ Involve customers in design from the outset Test whether end-designs meet customer requirements.	×
Redefine organisation processes to 'Increase customer value'. (S)	▪ Ensure the right processes are in place, producing the right results (e.g., maximise value add, accessible, competent, sufficient, facilitates flow, triggered by the customer, balanced).	✓
	▪ Find ways to deliver such value faster.	×
	▪ Include the extend supply chain in redefining processes.	×
Add value to the customer throughout the lifecycle of the product. (N)	▪ Focus on the customer experience throughout the lifecycle of the product.	×
	▪ Focus on internal (e.g. dealers) and external (e.g. motorists) customers when optimising for lifecycle value add.	×

Legend: ✓	Activity definition met
×	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Increase customer value' at Case two.

4.1.2 Organise by value stream

'Organise by value stream' is a strategy to configure organisation units to facilitate the flow of value. It requires multi-disciplinary teams to be set up around value-streams or product families as opposed to functions of an organisation (Womack and Jones, 2003:256; Liker, 1994:178; Bicheno, 2004:11). It creates strong horizontal accountability, although this does not have to be formal (Womack and Jones, 2003:238; Dennis, 2007:91; Liker, 2004:63- 64, 304). Lastly, it requires the role of the vertical organisation to be technology and quality focused as directed by the needs of horizontal leadership (Liker, 2004:179,304; Womack and Jones, 2003:280).

The following paragraphs summarise evidence of similar activities at case two:

Reconfigure teams to let value flow

Case two reorganises whole groups in their organisation due to changing customer demand around client managers or product managers, resulting in multi-skilling of employees (case two: I-20, I-26, P-345). The nature of their work is such that they share responsibilities across the value stream.

Install horizontal accountability and leadership

Case two organises their teams by client and installs client managers (case two: I-26).

Realign vertical roles

No evidence was found to suggest a realignment of vertical roles due to a horizontal aligned organisational structure.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-2: Summary of 'Organise by value stream' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Reconfigure teams to let value flow. (S)	- Multi-skill employees with skills that span the value-stream. ✓ - Use multi-disciplinary teams when designing or solving problems. ✗ - Multi-task teams with responsibilities that span sections of the value-stream, i.e. horizontally across the group (i.e. along the value-stream) to balance work. ✓ - Co-locate programme (value-stream) teams where possible. ✓	
	- Ensure strong horizontal or programme leadership is in place. ✓ - Create client or product teams that focus on one product family or client group. ✓ - Redefine the roles of the vertical or functional organisation to act as houses of technology, knowledge management, and suppliers of core services. ✗	
	Ensure the needs of the horizontal organisation gives primary direction to the daily activities of vertical functions. ✗	
Install horizontal accountability and leadership. (s)		
Re-align vertical roles. (N)		

Legend: ✓	Activity definition met
✗	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Organise by value stream' at case two.

4.1.3 Deploy policy

The Toyota strategy of 'policy deployment' starts with senior management setting targets for the broader organisation based on the perceived customer need (Liker, 2004:219, 262, Dennis, 2006:37). These targets are then translated into stretching management goals for departments throughout the organisation, using tools like A3-reporting, performance dashboards, and Deming's PDCA cycle (Dennis, 2006:69; Liker, 2004:263). A further iteration is done to achieve

detail worker plans per area, which becomes practical through kaizen events, daily problem solving and performance measures (Dennis 2006:20, 25, 129; Liker, 2004:219). These detail area plans, department and organisational goals are then regularly checked against plan and countermeasures taken where targets are not achieved (Dennis, 2006:43,137,141; Liker, 2004:262). Management continues to set stretching goals to drive continuous improvement (Womack and Jones, 2003: 95; Liker, 2004:262).

The following paragraphs summarise evidence of similar activities at case two:

Set targets for the broader organisation

Case two held strategic planning sessions where they reviewed their overall strategy to achieve customer value (case two:O-42).

Set specific management goals

No evidence was found to suggest specific management goals were set once an overarching strategy was in place.

Create supporting plans to achieve management goals

Case two has performance contracts for their employees (case two:P-234).

Check progress to plan on a regular basis

No evidence was found to suggest checking progress to plan on a regular basis.

Continue to set stretching goals

No evidence was found to suggest the continuous application of stretching goals once targets were met.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-3: Summary of 'Deploy policy' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Set targets for the broader organisation. (S)	▪ Set long term or overarching goals or targets for the organisation.	✓
	▪ Focus on simple and achievable goals.	x
	▪ Place greater emphasis on deployment rather than selection of goals.	x
Set management goals. (N)	▪ Develop a managerial deployment plan, including meetings where targets are discussed.	x
	▪ Translate the organisation needs, purpose and goals into rudiments (e.g. QCDSM).	x
	▪ Create dashboards that show measurable objectives, the indicator being measured, who is responsible to achieve the objective.	x
	▪ Follow Deming's Plan Do Check Act cycle achieving goals stipulated on the dashboards.	x
	▪ Set a deployment leader in place for each focus area.	x
Create supporting plans to achieve management goals. (S)	▪ Use A3 Dashboards as tools to plan, measure and attain goals.	x
	▪ Cascade longer term goals into practical targets for employees.	✓
	▪ Ensure team members make problems visible as they are encountered.	x
	▪ Hold employees accountable for gaining control over their area of influence.	✓
	▪ Install review schedules to facilitate the PDCA process.	x
Check progress to plan on a regular basis. (N)	▪ Install visual A3 measures to support regular reviews.	x
	▪ Ensure an iterative cycle takes place of deploying, monitoring, solving problems, improving.	x
Continue to set stretching goals. (N)	▪ Ensure goals are stretching enough to facilitate high performance.	x
	▪ Couple goals to a specific timetable.	x

Legend: ✓	Activity definition met
✖	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Deploy Policy' at case two.

4.1.4 Empower employees

Toyota believes it is the responsibility of all employees to improve work-related skills and work ethic (Toyota, 2007b:57). A number of activities are practised or encouraged to empower their workforce to achieve the abovementioned goals, and include the following: **training on the outcome required** (Liker and Hoseus, 2008:127,133), **following the Socratic Method** facilitated by their use of standard work (Liker and Hoseus, 2008:111,119; Toyota, 2004e), **multi-skilling in value-stream tasks** (Ballé and Ballé, 2005:135; Liker and Hoseus, 2008:260; TSAM visit, 2008 and 2010), **coaching** (Toyota, 2007b:8; Liker and Hoseus, 2008:117; Womack and Jones, 2003:267; Spear and Bowen 1999:98) **voluntary self-study** (Liker and Hoseus, 2008:23, 116), **holding employees responsible** (Liker and Hoseus, 2008: 147, 260, 335; Ballé and Ballé, 2005:135); Womack and Jones, 2003:267; Spear and Bowen 1999:98) and **rewarding the workforce** (Bicheno 2004:146).

The following paragraphs summarise evidence of similar activities at case two:

Train on the task-outcome required

No evidence was found to suggest internal training was done based on the task-outcome required.

Follow the Socratic Method

No evidence was found to suggest training follows the Socratic Method.

Train and multi-skill in value-stream tasks

Case two employees regard themselves as multi skilled (case two: P-408).

Ensure active mentoring and coaching

One of case two's employees experienced how the organisation's directors, after changing their focus, were able to provide much more regular input and time into her job (case two: I-32). A couple of case two employees felt they were being mentored (case two: P-408, P-401). Case two also has small teams, which help facilitate personal attention from the manager (case two:P-86).

Encourage voluntary self-study

No evidence was found to suggest voluntary self-study is encouraged at case two.

Hold employees responsible to surface and solve problems

Case two directors involve their employees in strategic decision making (case two: I-26, O-42) and recruit employees' opinions to improve the organisation (case two: O-46). Case two also allows some employees a lot of freedom to develop products – the example is where one consultant was given carte blanche in product development (case two:O-48). Some of case two's employees believe they are responsible for operational decisions (case two:P-408).

Reward improvement

No evidence was found to suggest improvement is rewarded in way similar to the fundamental nature of the TPS.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-4: Summary of 'Empower employees' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Train on the task-outcome required. (N)	Study the purpose of a job, translate into specific competencies required, and train accordingly.	x
	Train on and apply Standard Operating Procedures that break down a complex task into tiny work elements.	x
Follow the Socratic Method. (N)	Follow a training model that ask questions and draw responses, but that does not give the answer	x
	Ensure adequate on-the-job training by skilled coaches.	x
Train and multi-skill in value-stream tasks. (S)	Ensure a formal program is in place that multi-skill employees on tasks required by the product family they fall under.	✓
	Support multi-skilling through job-rotation.	x
	Measure progress towards multi-skilling as a key performance indicator.	x
	Ensure on-the-job development is a key responsibility for managers.	x
Ensure active mentoring and coaching. (S)	Ensure smaller teams that enable employees to have access to managers.	✓
	Follow an apprenticeship model, where experienced team members transfer skills they have required.	x
	Encourage employees to create their own development opportunities.	x
Encourage voluntary self-study. (N)	Ensure active mentoring and coaching to support employees along their learning journey.	x
	Ensure managers role model the required ownership of the organisation's targets.	x
Hold employees responsible to surface and solve problems. (S)	Make team members increasingly more responsible in key activities and decisions.	✓
	Ensure goals are clear and hold team members responsible through process confirmation.	x
	Institute an achievement of target and improvement suggestion rewards system.	x
Reward improvement. (N)	Ensure big and small achievements are rewarded, as the cultural benefit will outweigh the cost.	x

Legend:	✓	Activity definition met
	×	No evidence found linked to definition
	(S)	Some evidence found to suggest activity is present
	(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Empower Employees' at case two.

4.1.5 Eliminate waste before it occurs

Eliminate waste before it occurs requires that the products or services an organisation provides should be easily producible and assembled, with cross functional team participation through the design and execution process (Bicheno, 2004:27,171; Womack and Jones, 2003:117, 148, 193, 280; Liker 2004:137, 138; Ballé and Ballé, 2005:87). Throughout this process, waste should be reduced (Ohno, 1988:12, Womack and Jones, 2005) taking the product lifecycle into account (Womack and Jones, 2003:280).

The following paragraphs summarise evidence of similar activities at case two:

Involve a cross-functional team during the design process

Cross-functional team participation was evident at case two, balancing areas of expertise and co-locating team members (P-191).

Take the overall lifecycle into account

No evidence was found to indicate the overall lifecycle is taken into account in trying to eliminate waste before it occurs.

Design products that are easy to produce

Case two applies online psychometric testing (O-40) and standard formats (O-41) as a way to use technology to simplify administration of their product offering. One of the participants in the interactive presentation also noted that they balance production ability and product aesthetics (P-193).

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-5: Summary of 'Eliminate waste before it occurs' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Involve a cross-functional team during the design process. (S)	Involve a balanced team from the start of the design process, spanning the entire value chain.	✓
	Co-locate the team, especially during intensive periods of design.	✓
Take the overall lifecycle into account. (N)	Ensure specific resources are responsible to take the overall lifecycle into account.	×
	Include materials, technology, manufacturability, and maintainability when considering the lifecycle.	×
	Experiment with new technologies to radically improve performance and reduce costs.	×
Design products that are easy to produce. (S)	Ensure processes are simple by taking the seven wastes into account (transport, inventory, motion, waiting, over-production, over-processing, defects and waste).	×
	Improve or experiment with a design until it suits the manufacturing process and enables easy manufacturing.	×
	Where possible, use technology to simplify the manufacturing process.	✓

Legend:	✓	Activity definition met
	×	No evidence found linked to definition
	(S)	Some evidence found to suggest activity is present
	(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Eliminate waste before it occurs' at case two

4.1.6 Promote flow

The term *flow* is used to capture the TPS principle of linking operations output to customer demand (Ohno 1988:2, 39, 68, 95, 107, 127; Womack and Jones, 2003:110) and removing all hindrances towards achieving this goal (Womack and Jones, 2003:58, 60, 61, 319, Ballé and Ballé, 2005:182, 266). To this end, Toyota continuously develops a set of tools to facilitate flow (Marwinski and Shook, 2006: 18-19, 26-28, 39-42, 50, 63, 95-96; Liker, 2004:160, Ballé and Ballé, 2005:51), resulting in parts that arrive on time, in the right quantity and appropriate quality

(Womack and Jones, 2003:137; Ballé and Ballé, 2005:172). However, care is taken to have supply chain wide optimisation (Ballé and Ballé, 2005:226-228; Bicheno 2004:183).

The following paragraphs summarise evidence of similar activities at case two:

Link operations output to customer demand

Case two claims not to design products before the need arises from their customers, using the words 'Just-in-Time' delivery (case two:P-219).

Remove factors impeding flow

Case two uses subcontractors to level their load, potentially comparable to load levelling tools of Toyota, but specific to their environment (P-212).

Keep the overall supply chain in mind

Case two realises they can improve their service delivery by being more in touch with customer need, potentially indicating an understanding of the intricacies of their supply chain (P-226)?

Manufacture 'Just-In-Time'

Although case two claims 'Just-in-Time' delivery (case two:P-219), it does not immediately seem comparable to the description of the fundamental nature of the TPS, i.e. having scientifically analysed variation and brought it under control, instituting strict controls to ensure quality of products and being cognisant of the impact on the supply chain.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-6: Summary of 'Promote flow' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Link operations output to customer demand. (S)	Promote the frequent release of end-products in smaller quantities, until it is ideally linked with customer consumption.	✓
	Use the opportunity of inventory reduction to improve inevitable bottlenecks that will occur.	✗
	Conduct value-stream mapping or analysis to determine and prioritise required interventions at bottlenecks.	✗
Remove factors impeding flow. (S)	Ensure resources can handle the required number of change-overs and production quantities given customer demand and EPE targets by applying waste-reduction tools.	✓
	Conduct an extended supply chain analysis to prioritise areas for improvement.	✓
	Ensure orders are not released before resources become available (across the supply chain).	✗
Keep the overall supply chain in mind. (S)	Mix and match models in the final value-stream to lighten the burden earlier in the supply chain.	✗
	Manufacture 'Just-In-Time' when significant success has been achieved in reducing variation and lowering inventory.	✗
	Ensure rigorous shopfloor control, e.g. right quantity, 100% defect free, right location, perfect timing, seamless Kanban, etc.	✗
Manufacture 'Just-in-Time'. (N)	Measure the impact on the extended supply chain when manufacturing 'Just-in-Time'.	✗

Legend: ✓	Activity definition met
✗	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Promote flow' at case two.

4.1.7 Increase process effectiveness and efficiency

The TPS view of effective resources is that they are value adding or **valuable** from the customer's perspective (Womack and Jones, 2003:10, 19, Liker, 2004:27, 28, Bicheno 2004:10). The TPS strives to improve such resources until they are waste free or **capable**, producing at the highest quality, yield, speed and lowest cost throughout its lifetime, through a programme of scientific maintenance and uses tools such as TAKT time to prioritise improvement to resources (Dennis, 2007:39,40; Bicheno, 2004:36, 56; Marwinski and Shook, 2006:61, 92; Ballé and Ballé, 2005:254). The low waste environment is complemented with an absence of six major losses, downtime, changeover time, minor stops, speed losses, scrap and rework, resulting in resources that are **available**, delivering below TAKT time (Bicheno, 2004:57, 58; Dennis, 2007:40, 41, Marwinski and Shook, 2006:61). These resources are also right sized, or **adequate**, dedicated to specific value-streams (Womack and Jones, 2003:265, 316-317, Liker 2004:92-93). The quest is to be so **flexible** as to provide individual customers tailored products for their unique needs. This is the opposite of mass production (Ohno, 1988: xiv, Liker, 2004:8; Ballé and Ballé 2005:179).

The following paragraphs summarise evidence of similar activities at case two:

Ensure real value-add is specified – valuable

Case two exhibited evidence of actively seeking to understand what their customers regard as value adding. They ensure their products are best practise (P-240) and remain effective (P247), by focusing on their client needs (P-233).

Maximise the capability of processes by removing waste – capable

No evidence was found to suggest maximising the capability of processes by removing waste at case two.

Ensure a process or resource is available when required – available

No evidence was found to suggest ensuring a process or resource is available when required at case two.

Acquire processes and resources of adequate value-stream capacity – adequate

Case two uses subcontractors to level their load, potentially comparable to acquiring processes and resources of adequate value stream capacity, but specific to their environment (P-212). Case two also organises their teams by client and installs client managers (case two: I-26).

Modify processes or resources to do quickly change over from one product to another – flexible

Case two seems able to adapt quickly to changes in customer needs (P-240).

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-7: Summary of 'Increase process effectiveness and efficiency' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Ensure processes truly specify customer value. (S)	- Specify what real value add is from the perspective of the customer. - Ensure employees are aware of the difference between value add and no valuable.	✓ ✓
Maximise the capability of processes by removing waste. (N)	- Create a current and future state value-stream map to identify and prioritise waste elimination. - Conduct improvement (Kaizen) activities to realise waste elimination opportunities. - Use a team of dedicated improvement professionals to support waste elimination.	× × ×
Ensure a process or resource is available when required. (N)	- Ensure adequate maintenance programs to uphold required performance, utilising front line staff. - Measure the six major losses and overall equipment effectiveness to ensure availability. - Determine which resources produce below the required flow rate to prioritise interventions.	× × ×
Acquire processes and resources of adequate value-stream capacity. (S)	- Dedicate resources to specific value-streams or product families, avoiding shared resources. - Procure resources that are right-sized for the volume requirements of their value-streams. - Ensure resources can add incremental capacity.	✓ ✓ ✓
Modify processes or resources to quickly change over from one product to another. (S)	- Set up the organisation to be able to quickly understand changing market conditions and customer requirements. - Use tools to increase responsiveness, e.g. small lot sizes and quick set ups through applying SMED principles.	✓ ×

Legend:	✓	Activity definition met
	✗	No evidence found linked to definition
	(S)	Some evidence found to suggest activity is present
	(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Increase process effectiveness and efficiency' at case two.

4.1.8 Standardise

Standardisation suggests that work is structured according to a standard set of tasks, specifying content, sequence, timing and outcome (Liker, 2004:140-142; Spear and Bowen, 1999:97,98; Ohno, 1988:22); that management actively test whether these standards are in place as part of their knowledge transfer methods (Spear and Bowen, 1999:99; Liker, 2004:225; Liker and Hoseus, 2008:149-151), and that these standards are owned and updated by operators themselves (Liker, 2004:148, Bicheno, 2004:54-55).

The following paragraphs summarise evidence of similar activities at case two:

Structure and train to a standard set of tasks

Evidence was found to suggest work standards being applied. An example found is SOPs or operations standards in billing (case two:I-23, I-35, O-41).

Test whether standards are in place

No evidence was found to indicate management actively goes to the *Gemba* to test the implementation of these standards.

Have operators own and update standards

There was evidence that showed employees had access to own and update procedures, e.g., carte blanche to develop new standards (case two:I-35, O-48).

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-8: Summary of 'Standardise' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Structure and train to a standard set of tasks. (S)	▪ Create and apply standards which specify content, sequence, timing and outcome of operations.	✓
	▪ Break down and specify incremental work elements to below one minute each.	×
	▪ Institute systematic reduction of work content as part of continuous improvement.	×
Test whether standards are in place. (N)	▪ Test understanding of standard, focusing on method and quality, at Gemba (the place where work occurs).	×
	▪ Complement testing with process confirmation to ensure countermeasures taken will lead to increased standards adherence.	×
Have operators own and update standards. (S)	▪ Have employees own and update their own standards.	✓
	▪ Create standard work lists for managers and standard work check sheets for indirect labour.	×
	▪ Keep standards at the point of use, and ensure it is visual.	×

Legend: ✓	Activity definition met
×	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Standardise' at case two.

4.1.9 Formalise industrial engineering

The '*Formalise industrial engineering*' strategy of Toyota is part of the never ceasing focus on technical and labour efficiency to drive the profitability and sustainability of the organisation (Toyota, 2009a:2, 28; Toyota, 2008a:14; Toyota 2007e:14; Toyota, 2007f; Ohno 1988:18, 62). As opposed to incremental continuous improvement (*Kaizen*) Toyota follows a formal process for radical, stepwise improvement to reduce waste called *Kaikaku* (Bicheno 2004:145; Womack and Jones 2003:23). The outcome of such improvement is the reduction of work content and variation (Ohno, 1988:18; Ballé and Ballé, 2005:118, 133; Bicheno, 2004:55, 141; Womack and Jones, 2003:25). Toyota views these initiatives as sensible only if it results in cost reduction, which Ohno called profit making industrial engineering (Ohno, 1988:18, 71-72,126). A specific

focus of improvement is to optimise operations methods and layouts to enhance human performance, (Ohno, 1988:62; Ballé and Ballé, 2005:107,108; Dennis, 2007:62, 63, Marchwinski and Shook, 2006:7, 8; Liker, 2004:98).

The following paragraphs summarise evidence of similar activities at case two:

Install a process for facilitated, radical improvement

Examples of waste reduction was found - waiting (case two: I-23) and overproduction (case two: I-24) – but no evidence for a process facilitating radical improvement.

Let the industrial engineering department be profitable

No evidence was found to support 'Let the industrial engineering department be profitable' at case two.

Emphasize methods and layouts that are optimised for human performance

Case two organises their layout to share information, encourage knowledge management and facilitate teamwork (P-380; P-387).

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-9: Summary of 'Formalise industrial engineering' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Install a process for facilitated, radical improvement. (N)	▪ Ensure a team of dedicated, professional improvement agents are available to facilitate improvement	x
	▪ Install a system that highlights and facilitates opportunities for significant improvement, e.g., current-future-current cycles of value-stream mapping, reduction of inventory, etc.	x
	▪ Ensure sufficient management support is in place to support the proposed changes and provide continuity	x
Let the industrial engineering department be profitable. (N)	▪ Link improvement initiatives to financial impact.	x
	▪ Direct the team to ensure a scientific labour assignment approach, i.e. ensure standard work elements and volume requirements determine the number of resources assigned to a specific value-stream, whilst continuous improvement of work elements allow reduction in labour.	x
	▪ Task the team not only with improvement inside the organisation, but in its extended supply chain.	x
Emphasize methods and layouts that are optimised for human performance. (S)	▪ Create working areas where tools are point of use, flow is visual, and supply arrives in kits.	x
	▪ Create work cells conducive to teamwork and flow, e.g. Chaku-Chaku cells.	✓
	▪ Arrange work in progress and consumables to flow FIFO, with clear min/max levels.	x
	▪ Make 'flexible' procurement decisions, i.e. right-sized equipment preferably on wheels.	x
	▪ Have and apply colour and layout standards.	x

Legend: ✓	Activity definition met
x	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Formalise industrial engineering' at case two.

4.1.10 Create intelligent processes

Autonomation requires a machine to be stopped before damage is done to part, machine or operator, or before a defective product can be passed on (Toyota, 2004d; Liker 2004:16,129-132; Ohno 1988:6; Dennis, 2007:95; Toyota, 2008c:9). If a process is stopped, a system will call on a specific person to solve the problem (Spear, 2002:765). In addition, intelligence will be built into the system, preventing future occurrences of the problem, either through root cause problem solving or Poka Yoke devices (Ohno, 1988:6-8,121-122; Bicheno, 2004:137-138; Dennis, 2007:98-104; Liker 2004:128-130).

The following paragraphs summarise evidence of similar activities at case two:

Stop a process before damage can be done

Case two uses customer satisfaction triggers to alert them if their projects are not delivering the right type of value (case two:P-254).

Ensure specific accountability to add intelligence to processes

No evidence was found indicating ensuring of specific accountability to solve problems at case two.

Implement devices to prevent future occurrences of the problem

Case two use team accountability to prevent errors (case two:0-43).

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-10: Summary of 'Create intelligent processes' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Stop a machine before damage can be done to part, machine or operator. (S)	Install triggers that will stop a process if a defective product is being created, and after a production run is completed.	✓
	Allow employees to stop a process if they believe defects or other problems occur, and give immediate management attention once this happens.	x
Ensure specific accountability to add intelligence to processes. (N)	Ensure specific employees are assigned to respond to triggers	x
	Create an escalation system should problems not be solved within a specified time period	x
Implement devices to prevent future occurrences of the problem. (S)	- Install devices that automatically stop errors or hard wire the correct application, e.g. - 'go, no-go' gauges, i.e. contact Poka-Yoke; - devices ensuring a correct number, i.e. fixed value Poka-Yoke; and, - devices checking steps, i.e. motion step Poka-Yoke.	✓
	Install visual measures that display the correct outcome (if Poka Yoke devices are not possible).	x

Legend: ✓	Activity definition met
x	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Create intelligent processes' at case two.

4.1.11 Balance resources

To balance resources, Toyota fits customer demand into a level schedule, i.e., level demand and actively balancing operator work (Liker, 2004:115, Marchwinski and Shook, 2006:28). They do this through using standard work and TAKT time (Ballé and Ballé, 2005:79, 118, 133, Bicheno, 2004:55,141, Liker, 2004:147, 148), separating rework from normal production (Ballé

and Ballé, 2005:217; Ohno, 1988:41), and finding equilibrium between make to order and make to stock (Liker, 2004:121, 122).

The following table summarises the evidence according to the definitions set forth in the literature section:

Fit customer demand into a level schedule

Case two had assembled all their managers and reassigned roles and responsibilities to improve resource balancing (case two:I-25, I-26). In addition, case two seemingly used an informal way of scheduling that may have been possible because of the small size of the organisation. Case two asks team members if they have capacity and schedules accordingly (case two:O-45).

Use standard work to balance resources

Evidence was found to suggest work standards being applied. An example found is SOPs or operations standards in billing (case two:I-23, I-35, O-41). However, this was not linked to work elements below 1 minute.

Separate rework from normal production

No evidence was found to suggest case two separates rework from normal production.

Find equilibrium between make to order and make to stock

No evidence was found to suggest case two finds equilibrium between make to order and make to stock.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

Table 4-11: Summary of 'Balance resources' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Fit customer demand into a level schedule. (S)	▪ Install Heijunka boards or other devices to level the production schedule.	✓
	▪ Couple various processing steps through the use of Kanban cards and pull systems.	×
	▪ Mix and match models in final assembly.	×
	▪ Pull frequently to shipping and dispatch.	×
	▪ Ensure standard work is in place, specifying work elements to below 1 minute.	✓
Use standard work to balance resources. (S)	▪ Calculate the number of operators by taking standard work and dividing it by TAKT time.	×
	▪ Ensure standard work roll-out and improvement is part of a team leader's job description.	×
	▪ Balance not only work elements, but also effort exerted by operators throughout the day.	×
Separate rework from normal production. (N)	▪ Ensure zero defects are accepted or passed on.	×
	▪ Separate rework from normal production.	×
	▪ Make the supervisor responsible for performing rework.	×
Find equilibrium between make to order and make to stock. (N)	▪ Find a way to balance customer demand and make to stock, e.g. Toyota's example of 'change to order'.	×
	▪ Use supermarkets as a secondary method to balance manufacturing lines.	×
	▪ Ensure flexibility is available to finish each day's production targets, e.g. through overtime agreements.	×

Legend: ✓	Activity definition met
×	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Balance resources' at case two.

4.1.12 Enable visual management

Toyota uses visual management as part of their strategy to have efficient closed loop communication and make problems visible (Liker, 2004:158). Toyota enables this through a method and discipline called the 4 S'. This method consists of four activities: *separate*, *set in order*, *set countermeasures*, and *sustain*. Practicing these disciplines enables a visually self-explaining, self-ordering, and self-improving workplace (Ballé and Ballé, 2005: 121; Liker 2004:36, 150- 152, Dennis, 2007:31; Bicheno 2004:53)^{xv}.

The following paragraphs summarise evidence of similar activities at case two:

Separate

Evidence supporting 'Separate' or sorting include case two's implementation of a new project budgeting mechanism to ensure they kept focused on the correct information (case two:I-24).

Set in order

Case two uses some visible and standardised reports (case two:I-24).

Set countermeasures

An example of 'Set countermeasures' is the proactive nature of case two consultants in alerting directors to challenges they face (case two:P-436) and improved accountability (case two:I-24). A possible alternative to visual communication may include verbal communication, e.g., case two's assertion that they verbally raise awareness and address problems effectively (case two:P-429, P-422).

Sustain

No evidence was found supporting 'Sustain'.

Summary

The following table summarises the evidence according to the definitions set forth in the literature section:

^{xv} It is important to realise that the language used here denotes a rich set of activities and should not be taken at face value only. For more info refer to the literature study.

Table 4-12: Summary of 'Enable visual management' evidence for case two

Main activity	Definitions considered for the main activity	Outcome
Separate. (S)	Classify items and place / order by frequency of use	✓
	Red-tag items that are not used and place in a quarantine area.	x
	Create 4S action lists to direct activities (should become an ongoing habit).	x
Set in order. (S)	Organise all items in the work place according to frequency of use and importance, taking ergonomics into account.	x
	Create standards or measures that make it visible when something is out of place (from tools to performance measures).	✓
	Apply colour, sound and light to help enforce standards.	x
Set counter-measures. (S)	Establish a habit of regular cleaning, inspection and restoration of the established workplace order (specify what to inspect or clean, how to do it, and who should do it).	x
	Be proactive about raising countermeasures for anything that is found out of place.	✓
	Make problems that cannot be resolved immediately visible to management and fellow team members.	✓
Sustain. (N)	Create rules and standards for the practise of the first three S's.	x
	Ensure the standards are clear, simple and visual.	x
	Ensure managers conduct regular audits, promotion, communication and training on the requirement for visual management.	x

Legend: ✓	Activity definition met
x	No evidence found linked to definition
(S)	Some evidence found to suggest activity is present
(N)	No evidence found to suggest activity is present

This table shows that evidence supports the existence of a number of activities that inform the TPS Level One strategy 'Enable visual management' at case two.

4.1.13 Summary of results (activities and strategies) for case two

Table 4-13 shows a summary of the results of the preceding sections, and tallies the number of activities for which some evidence was found per each strategy:

Table 4-13: Summary of results for case two

TPS strategies	TPS activities	Outcome
Increase Customer Value (2/4)	Understand the customer's perspective of value.	S
	Re-engineer your core products to improve customer value.	N
	Redefine organisation processes to increase customer value.	S
	Add value to the customer throughout the lifecycle of the product.	N
Organise-by-Value-Stream (2/3)	Reconfigure teams to let value flow.	S
	Install horizontal accountability and leadership.	S
	Re-align vertical roles.	N
	Set targets for the broader organization.	S
Deploy Policy (2/5)	Set management goals.	N
	Create second-level plans to achieve management goals.	S
	Check progress to plan on a regular basis.	N
	Continue to set stretching goals.	N
	Train on the outcome required.	N
Empower Employees (3/7)	Follow the Socratic Method.	N
	Train and multi-skill in value-stream tasks.	S
	Ensure active mentoring and coaching.	S
	Encourage voluntary self-study.	N
	Hold employees responsible to surface and solve problems.	S
	Reward improvement.	N
Eliminate Waste Before it Occurs (2/3)	Involve a cross-functional team during the design process.	S
	Take the overall lifecycle into account.	N
	Design products that are easy to produce.	S
Promote Flow (3/4)	Link operations output to customer demand.	S
	Remove factors impeding flow.	S
	Keep the overall supply chain in mind.	S
	Manufacture 'Just-In-Time'.	N
	Ensure processes truly specify customer value.	S
Increase process effectiveness and efficiency (3/5)	Maximise the capability of processes by removing waste.	N
	Ensure a process or resource is available when required.	N
	Acquire processes and resources of adequate value-stream capacity.	S
	Modify processes or resources to quickly change over from one product to another.	S
	Structure and train to a standard set of tasks.	S
Standardise (2/3)	Test whether standards are in place.	N
	Have operators own and update standards.	S
	Install a process for facilitated, radical improvement.	N
Formalise industrial engineering (1/3)	Let your industrial engineering department be profitable.	N
	Emphasize methods and layouts that are optimised for human performance.	S
	Stop a machine before damage can be done to part, machine or operator.	S
Create Intelligent Processes (2/3)	Ensure specific accountability to add intelligence to processes.	N
	Implement devices to prevent future occurrences of the problem.	S
	Fit customer demand into a level schedule.	S
Balance Resources (2/4)	Use standard work and TAKT time.	S
	Separate rework from normal production.	N
	Find equilibrium between make to order and make to stock.	N
	Separate.	S
Enable Visual Management (3/4)	Set in order.	S
	Set countermeasures.	S
	Standardise.	N

Legend	S	Some evidence found to suggest activity is present
	N	No evidence found to suggest activity is present
	(X/Y)	Evidence found for X out of Y number of TPS activities

Another way to view the table above would be to graph the percentage of total activities supported by some evidence against the number of strategies with that percentage:

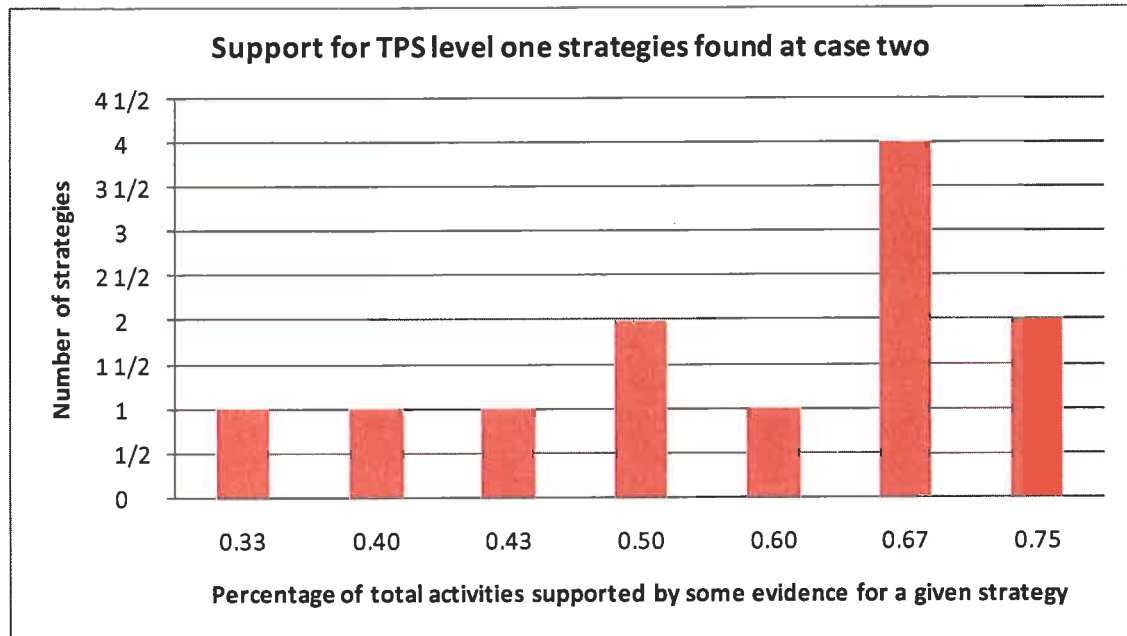


Figure 4-1: Support for the TPS Level One strategies found at case two

This may be a useful view to facilitate answering the main hypothesis, i.e. the fundamental nature of the TPS will be found at manufacturing organisations, by implication not at service organisations. With the fundamental nature specified as the twelve strategies of the TPS Level One, it is clear that case two has varying application of the TPS Level One strategies (the mean number of activities supported for each strategy is 61%, with a range of 35%). Evidence therefore does not support the main hypothesis, i.e., the fundamental nature of the TPS is not absent but rather partially found at case two.

4.2 Results for all cases (activities and strategies)

This section focuses on the remaining case results. It starts off by listing the results per activity for all cases and continues to summarise the results for the TPS strategies to answer the main research question

4.2.1 Results per activity for all cases

Table 4-14 shows the results of the TPS strategies broken down to activity level for all cases. Appendix D and G and H show provides the information from which this summary was created.

Table 4-14: Results for all cases – TPS strategies and activities view

Strategy	Activity	Case one	two	three	four	five	six	seven	Total
Organise-by-Value-	Understand the customer's perspective of value.	S	S	S	S	S	S	S	7/7
	Re-engineer your core products to improve customer value.	N	N	N	N	S	S	N	2/7
	Redefine organisation processes to increase customer value.	N	S	N	N	N	N	S	2/7
	Add value to the customer throughout the lifecycle of the product.	N	N	N	N	N	N	N	0/7
	Reconfigure teams to let value flow.	S	S	S	S	S	S	S	7/7
	Install horizontal accountability and leadership.	N	S	N	N	N	N	S	2/7
	Re-align vertical roles.	N	N	N	N	N	N	N	0/7
	Set targets for the broader organization.	S	S	N	N	N	N	S	3/7
	Set management goals.	S	N	N	N	N	N	N	1/7
	Create second-level plans to achieve management goals.	N	S	N	N	S	N	N	2/7
	Check progress to plan on a regular basis.	S	N	S	N	S	N	N	3/7
	Continue to set stretching goals.	N	N	N	N	N	N	N	0/7
	Train on the outcome required.	N	N	S	S	N	N	N	2/7
	Follow the Socratic Method.	N	N	N	N	N	N	N	0/7
	Train and multi-skill in value-stream tasks.	S	S	S	N	S	S	S	6/7
	Ensure active mentoring and coaching.	N	S	S	S	S	S	N	5/7
	Encourage voluntary self-study.	N	N	N	N	N	N	N	0/7
	Hold employees responsible to surface and solve problems.	N	S	S	S	S	S	S	6/7
	Reward improvement.	N	N	N	N	N	N	N	0/7
	Involve a cross-functional team during the design process.	S	S	S	S	S	N	S	6/7
Eliminate waste before it occurs	Take the overall lifecycle into account.	N	N	N	N	N	N	N	0/7
	Design products that are easy to produce.	N	S	N	S	N	S	S	4/7
	Link operations output to customer demand.	S	S	N	S	S	S	S	6/7
	Remove factors impeding flow.	S	S	S	S	S	S	S	7/7
	Keep the overall supply chain in mind.	S	S	N	N	S	N	S	4/7
	Manufacture 'Just-In-Time'.	N	N	N	N	N	N	N	0/7

(Table continues on the next page)

Strategy	Activity	Case one	two	three	four	five	six	seven	Total
Formalise	Increase process effectiveness and efficiency	Ensure processes truly specify customer value.	N	S	N	N	N	N	1/7
		Maximise the capability of processes by removing waste.	S	N	S	N	S	N	4/7
		Ensure a process or resource is available when required.	S	N	S	S	N	N	4/7
		Acquire processes and resources of adequate value-stream capacity.	N	S	S	N	S	N	3/7
		Modify processes or resources to quickly change over from one product to another.	S	S	S	N	N	N	3/7
		Structure and train to a standard set of tasks.	S	S	S	S	S	S	7/7
	Standardise	Test whether standards are in place.	N	N	N	N	N	N	0/7
		Have operators own and update standards.	S	S	N	N	S	N	4/7
	Industrial engineering	Install a process for facilitated, radical improvement.	S	N	S	N	S	N	4/7
		Let your industrial engineering department be profitable.	N	N	N	N	N	N	0/7
		Emphasize methods and layouts that are optimised for human performance.	S	S	S	N	S	S	6/7
	Create intelligent processes	Stop a machine before damage can be done to part, machine or operator.	S	S	S	N	S	N	4/7
		Ensure specific accountability to add intelligence to processes.	N	N	N	S	N	S	2/7
		Implement devices to prevent future occurrences of the problem.	S	S	S	N	N	S	5/7
		Fit customer demand into a level schedule.	N	S	N	S	N	S	3/7
	Balance Resources	Use standard work and TAKT time.	S	S	S	N	N	N	3/7
		Separate rework from normal production.	N	N	N	N	N	N	0/7
		Find equilibrium between make to order and make to stock.	S	N	S	N	N	S	3/7
Enable	Visual Management	Separate.	S	S	S	N	N	N	3/7
		Set in order.	S	S	S	S	S	S	7/7
		Set countermeasures.	S	S	S	N	N	N	3/7
		Sustain.	N	N	N	N	N	N	0/7
		Grand Total (outcome out of 48)	24	27	23	14	20	19	21

Legend **S** Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

The above summary is an intermediate step towards answering the main research question. The next section summarises the above information on a strategy level to conclude this step.

4.2.2 Results summary to answer the main research question

Table 4-15 shows the number of activities found to be supported by some evidence for each strategy at each case, given the total number of activities that describe the TPS Level Zero. As per the literature study, these 'outcomes' inform the prevalence of the TPS Level One strategies.

Table 4-15: Matrix to answer the main research question

Strategy	Case one	two	three	four	five	six	seven
Increase customer value	1/4	2/4	1/4	1/4	1/4	2/4	2/4
Organise by value-stream	1/3	2/3	1/3	1/3	1/3	1/3	2/3
Deploy policy	3/5	2/5	1/5	0/5	2/5	0/5	1/5
Empower employees	1/7	3/7	4/7	3/7	3/7	3/7	2/7
Eliminate waste before it occurs	1/3	2/3	1/3	2/3	1/3	1/3	2/3
Promote flow	3/4	3/4	1/4	2/4	3/4	2/4	3/4
Increase process effectiveness and efficiency	3/5	3/5	4/5	1/5	2/5	2/5	0/5
Standardise	2/3	2/3	1/3	1/3	2/3	2/3	1/3
Formalise industrial engineering	2/3	1/3	2/3	0/3	2/3	1/3	2/3
Create intelligent processes	2/3	2/3	2/3	1/3	1/3	2/3	1/3
Balance resources	2/4	2/4	2/4	1/4	1/4	2/4	1/4
Enable visual management	3/4	3/4	3/4	1/4	1/4	1/4	1/4
Grand total	24/48	27/48	23/48	14/48	20/48	19/48	18/48
Main hypothesis supported	x	x	x	x	x	x	x

Legend: x/y Number of main activities with some evidence out of total number of main activities

x Indication that evidence do not support the main hypothesis

✓ Indication that evidence supports the main hypothesis

The aim of the research is to explore the question: How prevalent is the fundamental nature of the TPS in selected South African organisations? The main hypothesis is that the fundamental nature of the TPS will be found in all selected manufacturing organisations (i.e. case one, three, four, six and seven), and by implication not at the selected service organisations (i.e. case two and five).

Compared to table 4-15, this implies full compliance for the manufacturing organisations (i.e. 48 / 48); and a zero outcome for the service organisations (i.e. 0/48). Table 4-15 shows the fundamental nature was partially found at all cases, no manufacturing showed full compliance, and one of the service organisations had a higher outcome than any of the manufacturing organisations (case two with 28/48 was the highest scoring case). Evidence therefore does not support the main hypothesis.

To discuss the study's main question, i.e. 'How prevalent is the fundamental nature of the TPS in selected South African organisations?', it may be useful to look at a cross-case analysis. The next section summarises activities where all or none of the cases supported the activity.

4.2.3 Activities found to the same extent at all cases

No strategies were found to have the same support at all cases. On activity level though, some activities are found to have the same prevalence at all cases (i.e. some evidence was found that shows an activity is taking place at all cases (7/7) or no evidence was found whatsoever (0/7)).

Table 4-16: activities where some evidence was found at all of the cases

TPS Level One strategy	TPS Level Zero activity	Total
Increase customer value	Understand the customer's perspective of value	7/7
Organise by value stream	Reconfigure teams to let value flow	7/7
Promote flow	Remove factors impeding flow	7/7
Standardise	Structure and train to a standard set of tasks	7/7
Enable visual management	Set in order	7/7

Table 4-17: activities not found at any of the cases

TPS Level One strategy	TPS Level Zero activity	Total
Increase customer value	Add value to the customer throughout the lifecycle of the product.	0/7
Organise by value stream	Re-align vertical roles.	0/7
Deploy policy	Continue to set stretching goals.	0/7
Empower employees	Follow the Socratic Method.	0/7
	Encourage voluntary self-study.	0/7
	Reward improvement.	0/7
Eliminate waste before it occurs	Take the overall lifecycle into account.	0/7
Promote flow	Manufacture 'Just-In-Time'.	0/7
Standardise	Test whether standards are in place.	0/7
Formalise industrial engineering	Let your industrial engineering department be profitable.	0/7
Balance resources	Separate rework from normal production.	0/7
Enable visual management	Standardise.	0/7

The following appendices show additional comparisons:

- Appendix L: Comparison and discussion of individual case results to Hayes and Wheelwright's (1979a) product process matrix
- Appendix M: Comparison and discussion of individual case results to competitive dimensions

4.2.4 Support for strategies given groups of cases

If the results are summarised as per the three groups of cases introduced earlier, it can be seen that service organisations have the most evidence for seven of the twelve strategies, followed by high-volume manufacturers having most evidence for four of the twelve strategies, and low-volume manufacturers for one. Table 4-18 shows this breakdown:

Table 4-18: strategies by group that showcased highest support for its presence

Group	Most evidence per strategy
Service organisations	▪ Increase customer value ▪ Organise-by-value-stream ▪ Deploy policy ▪ Empower employees ▪ Promote flow ▪ Standardise
High-volume manufacturers	▪ Formalise industrial engineering ▪ Increase process effectiveness and efficiency ▪ Create intelligent processes ▪ Balance resources ▪ Enable visual management
Low volume manufacturers	▪ Eliminate waste before it occurs

4.2.5 Activities supported by high-volume, low-volume and service organisations

A useful view to understand interdependencies may be to sort activities and strategies according to most support found for their presence given the three groups of cases proposed as part of the case selection process (high-volume manufacturers, low-volume manufacturers and service organisations). This section should be read in conjunction with section 4.2.3 showing where no or full support for activities was found, as this off course could be read as none of the three groups or all of the three groups of cases showed evidence.

Table 4-19 shows the activities which were most supported by high-volume manufacturers (using percentage of organisations where evidence was found for its presence). Table 4-20 repeats the analysis for low-volume manufacturers, and Table 4-21 shows the results for service organisations.

Table 4-19: activities most supported by high-volume manufacturers

Strategy	Activity
Deploy policy	▪ Set management goals ▪ Check progress to plan on a regular basis
Empower employees	▪ Train on the outcome required
Increase process effectiveness and efficiency	▪ Maximise the capability of processes by removing waste ▪ Ensure a process or resource is available when required ▪ Modify processes or resources to do quickly change over from one product to another
Formalise industrial engineering	▪ Install a process for facilitated, radical improvement
Create intelligent processes	▪ Implement devices to prevent future occurrences of the problem
Balance resources	▪ Use standard work and takt time ▪ Find equilibrium between make to order and make to stock
Enable visual management	▪ Seiri (Separate) ▪ Seiso (Shine, Set countermeasures)

Table 4-20: activities most supported by low-volume manufactures

Strategy	Activity
Empower employees	▪ Hold employees responsible to surface and solve problems
Eliminate waste before it occurs	▪ Design products that are easy to produce
Promote flow	▪ Link operations output to customer demand
Create intelligent processes	▪ Ensure specific accountability to add intelligence to processes
Balance resources	▪ Fit customer demand into a level schedule

Table 4-21: activities most supported by Service Organisations

Strategy	Activity
Increase customer value	▪ Re-engineer your core products to improve customer value ▪ Redefine business processes to increase customer value
Organise-by-value-stream	▪ Install horizontal accountability and leadership
Deploy policy	▪ Set targets for the broader organization ▪ Create second-level plans to achieve management goals
Empower employees	▪ Train and multi-skill in value-stream tasks ▪ Make coaches available
Eliminate waste before it occurs	▪ Involve a cross-functional team during the design process
Promote flow	▪ Keep the overall supply chain in mind
Increase process effectiveness and efficiency	▪ Ensure processes truly specify customer value ▪ Acquire processes and resources of adequate value-stream capacity
Standardise	▪ Have operators own and update standards
Formalise industrial engineering	▪ Emphasize methods and layouts that are optimised for human performance
Create intelligent processes	▪ Stop a machine before damage can be done to part, machine or operator

4.3 High-level overview of TPS Level Two and Three (values and purpose)

Although the main focus of the study is on the fundamental nature of the TPS, data gathering included the higher levels of the TPS (*values* and *purpose*). The goal was to gain more insight on the outcome of the lower levels (See appendix H for this evidence).

Results are summarised as the no. of pieces of evidence found indicating the presence of the higher levels at each of the cases. Tables 4-22 and 4-23 shows a breakdown of the amount of evidence (pieces) found at each case. For both *values* and *purpose* case two showed the most evidence.

Table 4-22: Support (pieces of evidence) for TPS Level Two values

Value	Case one	two	three	four	five	six	seven
Challenge	4	12	10	13	10	10	11
Kaizen	16	12	24	11	13	18	15
Genchi Genbutsu	8	8	12	9	8	6	11
Teamwork	11	24	12	10	19	11	12
Respect	6	14	10	11	14	5	8
Total	45	70	68	54	64	50	57
Average	9	14	13.6	10.8	12.8	10	11.4

Table 4-23: Support (pieces of evidence) for TPS Level Three purpose

purpose	Case one	two	three	four	five	six	seven
Success	4	10	6	14	10	12	10
Perfection	3	4	3	3	3	5	3
Contribution	5	7	4	9	8	7	6
Honour	9	14	4	10	11	9	11
Total	21	35	17	36	32	33	30
Average	5.25	8.75	4.25	9	8	8.25	7.5

4.4 Conclusion

This chapter tabled the results of the prevalence of the TPS Level One strategies at participating organisations as informed by the prevalence of the TPS Level Zero activities. It was shown that evidence does not support the main hypothesis, i.e. the fundamental nature of the TPS is not found at selected manufacturing organisations, rather it is partially found at all selected organisations.

The next chapter examines the implications of these findings, discusses reasons why this may be the case and elaborates on major limitations of this study.

5 Discussion of results and further research

This chapter examines the implications of evidence discussed in the previous chapter by discussing the method of research, cross-case analysis and individual case results. The majority of the discussion in this chapter will focus on cross-case results, as this also allows for discussing individual case results in the context of evidence found at other cases. The chapter concludes with a summary of the limitations of this study and suggested further research.

5.1 Methodology

The method will be examined by discussing the general research design as per the structure in Chapter three, i.e. approach, design, analysis, validation and preparation, and conclude with a summary of main limitations.

5.1.1 Approach

The approach followed stems from the research questions asked, which also determines the scope of the study. Potential weaknesses may exist given the research questions and scope.

Research questions and hypotheses

According to Leedy (1997:157), a case study is conducted to shed light on a phenomenon or to evaluate it; in the case of this dissertation to evaluate the fundamental nature of the Toyota Production System. The exploratory nature of this study led to a simple research question, i.e. 'How prevalent is the fundamental nature of the Toyota Production System in selected South African organisations?', again with a fairly simple hypothesis tied to this question, i.e. "The fundamental nature of the TPS will be found in all selected manufacturing organisations". The simplicity of these questions facilitates achievement of the goal of the research - to explore the phenomenon of the fundamental nature of the TPS. A weakness that may flow from such a simple question and hypothesis is that significant portions of the outcome of the study may be predicted prior to the research being concluded.

Scope

Creating a model of the TPS from a learning perspective and testing the model at selected organisations requires a fairly broad scope. Choosing a narrower scope, e.g. testing existing or established models of the TPS at selected organisations would allow for greater scope control. A weakness of the research approach (which was chosen specifically as a model of the TPS based on Bateson did not exist prior to this study) may be the broad scope required to answer the main research question.

5.1.2 Design

In addition to the limitations discussed in the data gathering techniques, other aspects of the research design may also have influenced the quality of data gathering.

Case selection

Given the hypothesis of the study (The fundamental nature of the TPS will be found in all selected manufacturing organisations), the selection criteria for cases included 'manufacturing' and 'non-manufacturing' organisations. Using Hayes and Wheelwright's product-process matrix (1979a), a further distinction was made for manufacturing organisations, i.e. organisations with higher volumes and fewer products, and organisations with lower volumes and numerous products. This resulted in three groups of cases, of which two to three organisations were sought to participate. Thus, the study researched a fairly wide spectrum of organisations, with distinct advantages and disadvantages:

- Advantages include the greater variety of contexts, which allow for greater testing of the model of the TPS; and a conclusion being based on the three distinctly different groups of organisations mentioned.
- Disadvantages include greater difficulty in isolating factors that drive differences between Toyota and the selected cases, e.g. culture, than if a more similar group of organisations were selected. The significant difference in scale and requirements of Toyota's operations to those of participating organisations also complicates the comparisons.

Controlling for culture

Given an abundance of literature on the Toyota Production System, and well-established theories that can explain cultural differences between Japan and South Africa, the study focused on building a model of the TPS based on literature alone, using visits to Toyota's South Africa manufacturing facility to augment the literature study (see section 3.2.6). Potential disadvantages of this approach include the following:

- Does not allow testing and maturing of the theoretical model against actual practice at Toyota itself
- Potentially less accurate isolation of the impact of cultural differences between South Africa and Japan, given assumptions in models like Hofstede (2001) used to explain differences (e.g. homogeneity of culture in South Africa)

5.1.3 Analysis

Use of fractions

The fundamental nature of the TPS is positioned as twelve strategies. These strategies are each associated with between three and seven activities. Evidence from selected organisations

is used to draw a conclusion on the presence of activities, which informs whether the strategies are practiced. The outcome of whether a strategy is in place at a participating organisation is positioned as a fraction (e.g. 2/3 or 5/7), based on the amount of activities associated with that strategy. The implication of varying amounts of activities associated with strategies is that strategies associated with fewer activities is less accurately measured (e.g. three activities has an interval of 33%), than strategies associated with more activities (e.g. seven activities has an interval of 14%). This is a weakness of the research design.

5.1.4 Validation

The most important aspects of validity for this study given its research design is construct validity and reliability.

Construct validity

This dissertation aims to achieve construct validity through the use of multiple sources of evidence (interactive presentation feedback, interviews, structured observations), clearly defined TPS strategies to guide the search for data, detailed matrices to ensure accurate analysis of data, and an informed review of the draft case study report.

However, the new definition of a model of the TPS (to ensure a learning perspective based on Bateson), with a corresponding new protocol not tested by previous research, potentially weakens the construct validity of the research and is a weakness of the research design.

Reliability

Reliability is achieved through use of a detailed protocol and highly specified descriptions of what are acceptable descriptions of the presence of a TPS activity. Evidence is furthermore stored and sorted in a database to support accurate handling of data.

However, the qualitative case study approach still requires interpretation of the researcher, and although care is taken, the analysis of data is open to some interpretation, which is a weakness of the research design.

5.1.5 Preparation and gathering

The following section will discuss the method in terms of the approach to gather data, focusing on the three main sources, i.e. the interactive presentation feedback, interviews and structured observations.

Interactive presentation feedback

As described in chapter three, the interactive presentation feedback gathered data by presenting the fundamental nature of the TPS. Participating organisations were asked to invite a cross-section of their management teams to a session where the fundamental nature of the TPS was presented. The audience was asked to record notes on their current application and

actions for future implementation as they were confronted with this knowledge. Their reaction was used to analyse the prevalence of the fundamental nature of the TPS at their organisation. To understand some of the limitations of this study, it may be useful to critically analyse potential shortfalls of this method. Three major potential shortfalls are discussed, namely the potential biasing effect of presentation of the TPS principles, objectivity of participants and lean jargon in use.

Potential biasing effect of the presentation of TPS principles - when the TPS principles were presented during the interactive presentation, it may have biased participants towards its existence in their own organisations as they tried to associate meaning to the concepts. If this is true, then it would have reduced the quality and integrity of data gathered.

Objectivity of participants - people often associate the Toyota Production System with best practise. Some individuals may not be objective about their own operations, and when recording notes on current practise of these principles may over or under-emphasize their application of these principles, potentially reducing the quality of the data gathered.

'Lean' jargon in use - participants in the presentation may already have had strong associations with words like 'standardisation', 'visual management', 'efficiency' and 'effectiveness', etc. Despite presenting the TPS meaning of these words, participants may have recorded notes and actions based on their own prior-developed description of these principles.

All of these may reduce the quality and integrity of data gathered through the interactive presentation feedback. Triangulation with other data gathering methods is therefore critical. However, these methods have potential limitations as well. Interviews as a data gathering method will be discussed next.

Interviews

The purpose of the interviews is to search for evidence that supports the presence of the TPS Level One strategies. The interviews focus on problems the organisation had recently resolved, as a potential indication of learning required or strategies used to overcome the stated problems. Interviews were conducted with three people from each organisation, operating at different levels in the organisation. Each interview was conducted with one person at a time to avoid peer pressure or group bias. Typically the CEO, a person on a level reporting directly to him or her, e.g., a senior manager, and a person on a level below reporting directly to a senior manager, e.g., a manager was used. The interview focused on examples of problems where the interviewee was involved. The interview focused on the context of the problem. The process was repeated twice for different problems with each interviewee.

However, the potential exists that the quality of information may have been compromised. The next paragraphs explain how prior attendance of the interactive presentation, selection of candidates, focus on problem solving and questions regarding the context of problems may have influenced data gathered.

Prior attendance of the interactive presentation - having provided participants with the 'language' of the TPS, they may have been biased to use this language when explaining how they have gone about solving these problems and what the context of solving this problem entailed, incorrectly enlarging the scope of the original solution.

Selection of candidates - during the interactive presentation, permission was asked to interview members of the audience from different management levels. Often, volunteers were selected. Potentially, those interested in problem solving or in the TPS may have volunteered. This could lead to a type of self-selection, reducing the objectivity of the research.

Focus on problem solving - questions during the interview focused on problem solving and the context of solving problems, with the idea that strategies used and activities undertaken to solve problems could provide a view as to whether strategies similar to the fundamental nature of the TPS was being used. This may have limited the ability of this data gathering method to inform all twelve TPS strategies, and becomes a limitation of this study.

To augment interactive presentation feedback and interviews, structured observations were conducted on the shop floor of manufacturing organisations or in the office areas of service organisations.

Structured observations

Some limitations exist given the structured observations approach. These include the time limited view of the study as well as a focus on shop floor areas of manufacturing organisations (i.e. excluding observations of office areas).

Cross-sectional view - the case study approach selected follows a cross-sectional approach (i.e. does not measure unfolding of events over time). Thus, a snapshot was taken on the given day when structural observations took place. That day may or may not have been a good representation of a typical day, and may have either over-emphasized or underplayed the practise of activities and employment of strategies similar to that of the TPS Level Zero and one respectively.

Focus on shop floor areas for manufacturing organisations - structured observations were made only in shop floor areas of manufacturing organisations (i.e. case one, three and six), and not of their office areas. Structured observations focused on, or included, office areas of service organisations (case two and five) as well as the 'in-between' organisations (case four and seven). Potentially, some evidence may have been missed at case one, three and six due to exclusion of their office areas.

With the limitations of the various methods, the multiplicity of the data gathering approaches improves the validity of the data gathered as triangulation can occur.

5.1.6 Summary of limitations given the research method followed

Given the method of research, certain limitations become apparent. Table 5-1 shows a summary of these limitations given the preceding discussion:

Table 5-1: Summary of limitations given the research method

Category	Concern	Potential limitation
<u>Approach</u>		
Research questions	Simple questions used	Part of the outcome may be able to be predicted from the start of the study
Scope	Idiosyncratic approach	Broad scope required to answer the main research question
<u>Design</u>		
Case selection	Great variety of cases selected	Potential difficulty in isolating factors that drive differences between Toyota and selected cases
Controlling for culture	Base case not conducted at Toyota	Potential difficulty in isolating the impact of cultural differences between South Africa and Japan
Analysis	Varying activities per strategy	strategies with fewer activities less accurately measures due to larger interval size
<u>Validation</u>		
Construct validity	New model and protocol designed	Model and protocol potentially not as mature as if existing models was used for comparison
Reliability	Exploratory, qualitative case study approach	Some analysis dependent upon interpretation by researcher
<u>Preparation and Gathering</u>		
Interactive feedback	Objectivity of attendees 'Lean' jargon in use	Data may have been influenced by the lack of objectivity of attendees. Participants may have recorded notes and actions based on their own prior-developed description of these principles.
Interviews	Prior attendance of the interactive presentation	Interviewees may have incorrectly enlarged the scope of the original problem they solved with newfound TPS language.
	Selection of candidates	Potential self-selection of candidates interested in problem solving, reducing objectivity of analysis.
	Focus on problem solving	Limited ability of this data gathering method to inform all twelve TPS strategies.
Structured observations	Cross-sectional view	Snapshot view may have over-emphasized or underplayed the practise of activities and employment of strategies.
	Focus on shop-floor areas of manufacturing organisations	Some evidence may have been missed at case one, three and six due to exclusion of their office areas from structured observations.

Given these limitations, the next section will endeavour to review the outcome of results of individual cases, with a major focus on case two.

5.2 Results discussion from a TPS Level One perspective

The next section discusses the results from the perspective of the twelve strategies of the TPS Level One. Sub-sections focus on the number of cases where some evidence was found suggesting the TPS Level Zero activities were being practised. The outcome of every activity is considered, with some references to inter-dependencies depending on the way cases were selected, e.g. the potential impact differing competitive strategies, product / process type and cultural differences may have had on the outcome of the project.

5.2.1 Increase customer value

Some authors describe the focus of Toyota on understanding customer value as one of the key distinguishing factors between the TPS and other production systems (Bicheno, 2004:10; Womack and Jones, 2003:10, 16, 19). To cover the study's strategy of *Increase customer value*, the selected cases had to show a deep understanding of what the customer perceives as value; a discipline of rethinking their product lines based on their understanding of customer value, a habit of re-establishing organisation process to manufacture these products or services due to an increased understanding of customer value, and focusing on adding value to the customer throughout the lifecycle of the product.

Although the selected cases shared an awareness of the importance of customer value, evidence shows only partial practise of activities informing the TPS strategy of *Increasing Customer Value*.

All understanding of what the customer perceives as value (7/7)

Evidence found suggested sensitivity towards what the customer perceives as value. Evidence also supported a relational approach towards understanding customer value. As an example, however, the relational approach is different from Toyota's approach of salesmen visiting customers at their homes to understand their experience with Toyota and product needs (Liker 2004:177). Instead, what was rather found is an example of case two where managers are assigned customers to understand their needs (case two: I-26, P-44, P-51, P-65, P-226), which seems to be a more formal approach than that of Toyota.

Some re-engineering of products to improve customer value (2/7)

Despite this relational approach and sensitivity to customer value, limited evidence exists of a scientific process of customisation based on what the customers jointly defined as value, i.e., an awareness of customer value seemingly did not translate into detail changes to products.

Exceptions (listed in the results section) to this was case six's development of a bankrupt competitor's product after a customer request, and case seven's experimenting with new menu items and communication devices (case six-I-100; case seven: P-77). However, in case six's

situation, it could have merely been a re-active approach to a customer request, as opposed to Toyota's proactive approach (Womack and Jones, 2003:226, Ballé and Ballé, 2005:85).

Some redefinition of business processes to increase customer value (2/7)

The lack of change of products based on an improved understanding of customer value will influence the change of organisation processes to do more of what the customer wants and less of what the customer does not want. This could explain why only two of the seven cases showed evidence of re-engineering organisation processes to increase customer value. The cases that did change their organisation processes did so as they viewed the activity involved as something for which the customer would not be willing to pay (case two:I-21; case five:P-41).

Limited coverage of this point may be better understood when considering the selected cases' position on the product process matrix (Hayes and Wheelwright, 1979a:135). The selected cases do not fall in the same category of the product and process lifecycle as Toyota, i.e., high volume connected line flow with fewer products. As a result, organisation processes are less standardised, with a greater tolerance for customisation. The evidence of changed processes may, therefore, be less salient because customisation is the norm. This could potentially also explain why evidence was found to show case two re-engineered products based on changed perception of customer value, but not processes.

No value-add to the customer throughout the lifecycle of the product (0/7)

Other than the selected organisations not practising this activity, the lack of evidence found to suggest a lifecycle focus may have been caused by the research approach (cross-cutting approach vs. longitudinal / time series analysis), e.g. on the given days when research was conducted lifecycle focus of products was not a priority for the selected organisations. Another reason could be cultural differences of long term orientation (which could lead to more consideration of the overall lifecycle), where Japanese culture has a very high score and where South African culture is expected to have a lower score (Hofstede, 2003).

Other limitations

The example of understanding the customer's perspective of value through relationships may have been limited due to the study not interviewing individual customers of the related cases to confirm what was suggested by evidence. Another limitation is a lack of focus on the detail of new product and process designs to understand how big a role the voice of the customer plays in this.

Main hypothesis

Given the above remarks and limitations, it seems the main hypothesis is not generally supported, with only service organisations redefining organisation processes to increase customer value, and as a result practising the same number or more activities than manufacturing organisations for 'increase customer value'.

5.2.2 Organise by value-stream

The TPS assumes the existence of value-streams and claims the success of their operations is linked to organising their organisation around such streams (Toyota, 2003b:48; Liker, 2004:64). To be similar to Toyota, the selected cases had to reconfigure their teams to let value flow, install horizontal accountability and leadership (i.e., product or customer based, not only functionally based) and realign vertical roles accordingly.

The selected cases all practised reconfiguring of teams to let value flow; but evidence shows only partial practise of the remaining activities informing the TPS strategy of *organise by value-stream*.

All reconfiguring of teams to let value flow (7/7)

Some difficulty exists when comparing organisations with a dissimilar product-process approach to that of Toyota with the TPS, i.e., multiple low volume products with few major high volume products as depicted in the product-process matrix of Hayes and Wheelwright (1979a:135).

Evidence showed that the selected cases with small product offerings were set up in a way similar to that of Toyota, whereas the cases with more products only used multi-disciplinary teams but were not intentionally set up around specific value-streams.

As discussed in the results (also see appendix D and G), case six organised their shop floor according to specific products as opposed to specific functions. Case two and case five split their employees according to customers. This is similar to the way Toyota sets their factories up. Case seven, as a franchise organisation, by its very nature configures smaller teams to focus on specific customer segments, which could be seen as an alternative to the TPS strategy of *organise by value-stream*.

Case one, three and four, as shown in the results section, all had evidence of multi-disciplinary teams achieving specific customer outcomes, but were not intentionally set up around customer-driven value-streams. Comparing the product-process lifecycle, case one and case four have a very high variety of products on offer, which raises the questions of whether these organisations can be directly compared with Toyota as stated earlier, and the set-up of multi-disciplinary teams around specific customer outcomes may, therefore, already be the application of a similar concept along different stages in the product-process matrix. Case three manufactures a relatively small range of products in South Africa, but its parent organisation has thousands of products on offer, also raising the question of whether a direct comparison is possible.

Some horizontal accountability and leadership (2/7)

As per the results section, case two organises their organisation around customers, and case seven around products. For big clients case two's approach would be similar to Toyota's operations as there will be no multi-tasking across customers. Case seven is set up around

specific franchise products, which is similar to Toyota. Case five, due to its small size, could be viewed as a single value-stream with the entire organisation set up to deliver value to this stream.

No realignment of vertical roles (0/7)

The study found no evidence to suggest vertical roles were realigned after setting up a horizontal focus, which in itself is a riddle, as logic would prescribe that vertical roles would change if there is horizontal accountability. One explanation could be that a cross-sectional study may not gather the changes in vertical roles over time. In such situations, Yin (2003:124) suggests a time series or longitudinal analysis rather than an explorative case study approach.

Other limitations

Given the results, a question is whether the cases organised around value-streams did so only when it made economic sense? And if rational behaviour of an organisation is assumed, that organisations with numerous diverse product offerings will not set their organisations up around value-streams, unless they solve a specific problem requiring such a focus? This study is unable to explain why certain cases are set up around value streams and others not, which becomes an opportunity for further research.

Main hypothesis

Given the discussion, it seems the main hypothesis is not generally supported for 'organise by value-stream'. Case two and five practised more activities informing this strategy than the manufacturing organisations.

5.2.3 Deploy policy

Toyota lists as one of their guiding principles the need to create customer value (Toyota, 2009a:10). Toyota has a strategy in place to make achieving customer value real and tangible throughout their organisation, and is referred to as 'policy deployment' in this document. activities that inform policy deployment include senior management setting targets for the broader organisation based on the perceived customer need; translating these targets into stretching management goals for departments; creating detail deployment plans per area, regularly checking these against plan, and continuing to set stretching goals.

Evidence show partial practise of activities informing the TPS strategy of '*deploy policy*', which is discussed in the following paragraphs:

Some setting of targets for the broader organisation (3/7)

The evidence showed cases one, two, and seven set targets for the broader organisation, similarly to Toyota. For the remaining cases, could it be that the research methodology used missed some evidence that would point to overarching organisational goals? Firstly, the use of

interviews, interactive presentations, and structured observations may presuppose that the goals would be top of mind to the individuals participating if it were to surface during data gathering. Leading questions were avoided with regard the TPS strategies, hence some individuals may not have mentioned organisational goals. Secondly, although an overarching strategy may have been set for the organisation, if it was not visible during the structured observations (i.e., printed and posted within sight), it may not have been noticed.

Another explanation could be the differences between Japanese and South African culture. Japanese culture avoids uncertainty to a much greater degree than South African culture, which could mean that South Africans are more comfortable with not understanding the organisation's overall direction than their Japanese counterparts, and therefore, are potentially less prone to viewing the setting of overarching goals as an absolute necessity (Hofstede, 2001: xix-xx, 160-161; 2003). The higher masculinity index of Japan, indicating Japanese are more competitive than their South African counterparts, could result in the setting of goals to drive higher performance as a natural extension of their culture (Hofstede, 2001:298).

Some setting of management goals (1/7)

Only case one set specific management goals, the next level in the translation of the broader goals of the organisation, in a similar way to Toyota. Case two and case seven, who set overarching goals, seemingly did not translate their overarching strategy into specific management goals. Again, as explained above, the research approach and methodology may have missed some inconspicuous evidence. The absence of overarching goals for case three, four, five and six could explain why they do not set specific management goals.

Some creation of managerial deployment plans (2/7)

The evidence showed case two and case five created managerial deployment plans. Case two and five's absence of specific management goals, and yet presence of managerial deployment plans, would raise the question whether some evidence was missed that would point towards specific management goals, or whether evidence was interpreted incorrectly to point towards the presence of managerial deployment plans to achieve goals.

For case two, the research methodology and approach could play a role in missing some inconspicuous evidence. As to the interpretation of evidence, performance contracts were used as evidence of managerial deployment plans (case two:P-234). It may be argued that performance contracts are generic and not real translations of specific management goals to managerial deployment plans. However, consideration was given to the type of actions required to create performance contracts. To draw up performance contracts, management needs to ask what is important for specific employees to achieve, or what will be correct results. This is the same type of activity required to draw up managerial deployment plans from management goals.

The same argument around research methodology and approach holds for case five. Another explanation could be the small size of case five. Its management team of three could be in unison around the overarching goals for their organisation and their expectations of themselves, and see no need to make their personal goals visible for the small team that works for them. That would, however not mean that they will not set specific goals for the team. Again, modification of the research methodology and further research will help to uncover whether this is true.

Some checking of progress against plan (3/7)

The evidence shows case three and case five check regular progress to plan. Again, the argument around research methodology and approach as described above could explain the absence of some evidence at the other cases, and especially case two, as performance appraisal of employees was not studied in detail. It would also make sense for case five to check progress against plan as they had specific employee plans in place.

Case three, however, needs to be discussed in further detail to understand why they would check progress against plan if no evidence exists of higher level goals being in place. Apart from the argument around research methodology, analysis of the evidence used could shed some light. The evidence used for case three was regular walks along its process to discuss performance (case three:P-332). Hence, the behaviour of the specific manager of the area played a key role in checking progress against plan. Although the specific plans were not visibly posted, as part of their management style they could prefer audible communication as opposed to visual communication. However, this would need to be confirmed by further study.

No continuous setting of stretching goals (0/7)

No evidence was found to suggest management continued to set stretching goals. The cultural comparison discussed in 'some setting of targets for the broader organisation' could also explain the absence of evidence with regard to continuous setting of stretching goals. In addition, a cross cutting / 'snapshot view' approach as opposed to a study of history or a time-series analysis may not be the best way to understand whether stretching goals had been set in the past but was just not apparent when visiting the specific organisations.

Other limitations

Two limitations regarding the legitimacy of 'deploy policy' evidence are considered:

Absence of full coverage of 'Increase customer value' could render any evidence for policy deployment meaningless - the evidence selected for this study showed only partial coverage of the 'increase customer value' strategy of Toyota. Achieving customer value is a guiding principle of Toyota. Any strategy deployed that does not have the aim to 'Increase customer value' is, therefore, not in line with the fundamental nature of the TPS, and it may, therefore, be

a valid question whether policy deployment in the absence of full coverage of 'Increase customer value' is even possible from the TPS perspective.

Absence of an overarching strategy or departmental strategy may disqualify evidence applicable to a lower level - some of the selected cases shows evidence of worker goals being set and measured on a regular basis but no evidence was found that suggested departmental or management goals were in place, or in other cases neither showed departmental/management goals or an overarching strategy for the organisation. A valid question might, therefore, be whether the absence of a more senior level goal or plan, e.g., departmental, disqualifies the evidence to be applicable to a lower level, e.g., detail worker plans.

Main hypothesis

Given the discussion, it seems the main hypothesis is not generally supported for 'deploy policy'. Although evidence showed case one, a manufacturing organisation, to practise most of the activities informing policy deployment, some activities are not practised, i.e. the fundamental nature of the TPS is not found in case one. Secondly, case two and case five (service organisations) practised more activities than the remaining manufacturing organisations.

5.2.4 Empower employees

To 'empower employees' in a similar way to Toyota, organisations would need to train on the outcome required, follow the Socratic Method, multi-skill in value-stream tasks, coach, encourage voluntary self-study, hold employees responsible to surface and solve problems, and reward the improvement.

The evidence as discussed earlier (also see appendix D and G) suggested the presence of training on the outcome required, multi-skilling employees in value-stream tasks, coaching and holding the workforce responsible. No evidence was found that supports following the Socratic Method, encouraging voluntary self-study or rewarding improvement.

Some training on the outcome required (2/7)

Evidence exists to suggest case three and case four train on the outcome required. The research methodology used interviews, interactive presentations and structured observations to come to this conclusion. However, it was mainly through interviews that evidence was found supporting 'train on the outcome required'. Hence, a question may be asked whether other methods of data collection would have rendered more evidence, e.g., a historical analysis of training events, or videotaping events, etc. This becomes one of the limitations of the study and also a suggestion for further research.

No following of the Socratic Method of training (0/7)

To train following the Socratic Method might be one of the more difficult activities to replicate, given the patience required not to supply answers but facilitate training to be a journey of self-discovery. It could be argued that this approach is fundamentally different from other training methods where answers are readily supplied. It could also point to a critical cultural difference. Following the Socratic Method will not allow for passing through a training session without learning a skill, as the training sessions technically does not end if the participant has not learned the skill yet. Other training methods potentially allow candidates to attend the training but not learn the required skill, reducing the impact of the training event. This could be partially explained by the difference between Japan's very high long-term orientation outcomes, compared to the rest of the world's outcomes. Long-Term Orientation (LTO) is an indication of the time horizon to which a society prescribes, and a high outcome could mean that a society would continue to learn until a skill-set is mastered (Hofstede, 2003). Unfortunately, Hofstede did not measure LTO for South Africa when he conducted his global cultural analysis, but should a similar outcome to that of the USA have been found, it could have explained the absence of following the Socratic Method.

Some train and multi-skill in value-stream tasks (6/7)

Two differences between the selected organisations and Toyota may explain the seemingly high similarity, i.e. the position on the product-process matrix as it relates to the size of the organisations, and the cultural differences in uncertainty avoidance.

Firstly, the selected organisations were all smaller than Toyota, with more variability in processes and a higher number of products. In such organisations, it may not be economically viable to have dedicated resources for certain process steps or product groups, and resources will be required to multi-skill. A key difference though is Toyota does not multi-skill amongst various product groups, but rather along a value-stream (i.e. instead of doing the same task for multiple product groups, rather do various tasks in one product family). In this light, the evidence for case two might be superficial. Here, the employees on more than one occasion regard themselves as multi-skilled. However, their multi-skilling also spans different product groups. The measuring instrument may therefore not have been accurate enough to differentiate between these two circumstances, becoming a limitation of the study.

Secondly, South African culture's lower outcome for uncertainty avoidance may indicate a stronger entrepreneurial drive amongst South Africans and South African organisations when compared with Japanese and their organisations. In the South African environment, employees may be more inclined to take on new tasks and challenges, whereas the Japanese may avoid it. Toyota's approach to multi-skilling in value-stream tasks is a scientific approach that breaks work elements down to single minutes and balances the line by adding or subtracting value

minute elements, requiring multi-skilling. No evidence was found at the South African organisations indicating a similar rigid approach to standardisation and balancing, which means a different value proposition could be driving multi-skilling.

Some ensure active mentoring and coaching (5/7)

Evidence shows coaches are available at five of the seven cases. The high outcome may again be explained by the smaller size of the organisations resulting in more immediate access to managers (case two, four, five, and six). The exception, case three (a fairly large organisation), implemented coaching to solve recurring quality problems (not as a cultural norm of workforce empowerment), which could explain the presence of this activity.

No encouragement of voluntary self study (0/7)

Although no specific evidence was found that indicated organisations actively encourage self study, it would be difficult to prove an argument claiming the selected cases discourage voluntary self study. Current legislation in place encourages South African organisations to create opportunities of learning through mandatory investment in skills funds, and an acute skills shortage drives most organisations to develop the skills of their workforce. The fact that these opportunities were not openly communicated or found through the research methodology used does not mean employees have no access to learning opportunities.

Another reason could be that culturally, the high masculinity outcome and related drive for perfection in Japanese culture as compared to South African culture, would have Japanese employees more inclined to pursue self-improvement training programs than their South African counterparts (Hofstede, 2001:298).

Some holding employees responsible to surface and solve problems (6/7)

Six out of seven cases hold employees responsible to surface and solve problems for various tasks, organisation values and the outcome of their work. This may again partly be explained by the smaller size of some of the cases (i.e., case two, four, five, and six). The franchise strategy of case seven may be a natural way to 'Hold employees responsible to surface and solve problems', as franchise owners naturally want to maximise their profit.

No reward of improvement (0/7)

Although the selected cases did not have incentive schemes in place to reward employees for their suggestions, various South African organisations do have incentive schemes in place. The selection of the cases could, therefore, play a role in no evidence being found, and becomes one of the limitations of the study.

Other limitations

As highlighted in the preceding sections, a historical analysis or direct analysis of training events will be able to shed additional light on workforce empowerment at the selected cases.

Some may argue that training according to the Socratic Method is a non-negotiable facet of workforce empowerment according to the fundamental nature of Toyota (e.g., Liker and Hoseus, 2008).

Main hypothesis

Case three practised four out of seven activities, the best outcome of all the cases, as opposed to case one who only practised one out of seven activities, the worst outcome (both of these are manufacturing organisations). Case two and five (service organisations) practised three activities, more than case one but less than case three. No conclusion can therefore be drawn regarding the main hypothesis for 'empower employees'.

5.2.5 Eliminate waste before it occurs

To 'Eliminate waste before it occurs', the participating cases needed to involve a cross-functional team during the design process, eliminate waste before it occurs and design products that are easy to produce.

Some involvement of cross-functional teams during the design process (6/7)

The South African organisations that participated in the study seem to have a pragmatic approach to operations, with teamwork being part of this process. Cross-functional teams are involved at the place where value is created (at the shop floor and or at the interface with the client in a service organisation). Part of the explanation of this high outcome may be the position that most of the cases hold on the product-process matrix as developed by Hayes and Wheelwright (1979a:135). Due to higher customisation, lower volume and potentially less maturity of the market, these cases may require more frequent multi-disciplinary problem solving, and hence comply easily with this activity of the fundamental nature of the TPS.

No taking the overall lifecycle into account (0/7)

The strong driver for a multi-disciplinary design approach does not seem to impact the entire lifecycle of products. Potentially the methodology of interviews, interactive presentation and structured observations may have missed some evidence that points towards the overall lifecycle. Alternatively, the higher uncertainty avoidance outcome of Japanese culture as opposed to South African culture (Hofstede, 2001:160-161) may explain why there is less of a focus on getting a design flawless throughout its lifecycle in the selected South African cases

Some design of products that are easy to produce (3/7)

Case two, six, and seven displayed evidence towards proactive design of products or services that are easy to produce or deliver. Differences in the type of product and process may explain the absence of this activity in remaining cases. Case one, a tier supplier to Boeing and Airbus, design only a few of their own products, with almost no influence on the design of remaining products. Case three is in a similar make-to-print position, with the bulk of their products imported in bulk and repackaged in South Africa. Case four designs and manufactures

jewellery, which could be considered an art – with less of a focus on easy manufacturing. Case five already has a very simple product – placement of individuals in professional jobs, which would either be difficult to simplify further or would be missed as a result of the measuring instrument potentially not sensitive enough to understand differences in product design at case five.

Other limitations

A complicating factor raised by case one and three is their make-to-print environment where they have little influence over design. In such an environment, the strategy of *eliminate waste before it occurs* could take on a different meaning, one which this dissertation has not presented, and which is suggested for further study.

Main hypothesis

Case two, four and seven practices two out of three activities related to eliminate waste before it occurs. The remaining cases all practices one out of three activities. Again, evidence does not support the main hypothesis as service or in-between organisations practised more activities than their manufacturing counterparts.

5.2.6 Promote flow

Most of the selected cases aim to link their production to the consumption needs of their customers, be it by nature of their organisation model or through proactive steps to increase the every-product-every ratio. A number of Toyota tools are in use to improve this flow, and on a local level all seven cases have been able to implement tools to improve flow or reduce impediments. However, improving flow throughout the supply chain is less practised, and no evidence shows the activity of Just in Time being practised. .

Some linking of operations output to customer demand (6/7)

The smaller nature of the selected cases may have played a role in the high outcome of the linking operations output to customer demand, as they potentially 'live' closer to their customers due to higher customisation. Case three, the largest of the participating cases, did not portray evidence of clear linking of their output to customer demand. However, they seemed to carry low inventory (case three: O-52, O-56), which means the methodology of interviews, interactive presentation and structured observations may have missed some evidence that would indicate linking operations to customer demand.

All removing of factors impeding flow (7/7)

The popularisation of lean tools and techniques aimed at waste reduction has led to these tools being common in most modern organisations. This, as well as a potential bias in organisations choosing to participate valuing continuous improvement in general (i.e., organisations that had no value for continuous improvement would not have agreed to participate) may have led to the high number of activities found being practised in this category.

Some keeping the overall supply chain in mind (4/7)

Case one, two, five and seven keep the overall supply chain in mind. Dependence on the supply chain may provide insight into the cases that practise this activity and those who don't.

For the cases who practise this activity:

- Case one and case seven are highly dependent on their supply chain for daily production (case one imports 90% of material and case seven is in the fast-moving consumer goods industry as a fast food franchise chain, and necessitating good integration with their supply chain).
- Case two and case five, both in human resources consulting, mostly use contractors, and would therefore be dependent on a good relationship (e.g., case five:P-212) and require input from their contractors to predict future customer behaviour (e.g., case two: P-226).

For the cases which do not practise this activity:

- Case three, as part of a multi-national pharmaceutical group falls in with international trade agreements between suppliers and has little control over their suppliers.
- Case six, purchasing basic commodities to produce their products, may be less dependent on good relationships with their suppliers as they are easily replaceable.
- Case four's lack of focus on the overall supply chain remains a mystery as they need to integrate fairly well with their supply chain of specialist jewellery material (gold, diamonds, designs, franchise outlets). It is likely that the measuring instrument may have missed evidence that would support the practise of this activity at case four.

No Just-in-Time manufacture (0/7)

The position on the product-process lifecycle matrix (Hayes and Wheelwright, 1979:135a) may explain why no evidence was found to suggest Just-in-Time manufacture. None of the cases have product-process combination at the same level of maturity as Toyota. Application of Just-in-Time manufacturing may also be limited due to the continuous improvement maturity level of organisations, with various authors pointing out that this step is taken only after most other improvement strategies are in place (Womack and Jones, 2003; Ballé and Ballé, 2005; Liker, 2004; etc.).

Other limitations

Some complications of the environment of the selected cases include very small second and third tier supply bases, even for the larger cases one and three. As these organisations already act as suppliers to global counterparts, there might be limited ability to influence overall supply chain effectiveness. The franchise environment of case four and seven pre-supposes being closer to customers and more sensitive to their demands. The remaining cases two, five, and six are relatively small organisations, which means either no supply chain for them exists (they

are the last tier) or no ability to influence their supply base as small players. Therefore, it might be a difficult comparison with Toyota's ability to influence their supply chain, becoming a limitation of this study.

In addition, different positions on the product-process matrix of Hayes and Wheelwright (1979) need to be considered. Although the measuring instrument found most cases applying most of the activities (barring Just-in-Time manufacture), it is an open question whether these organisations would be able to achieve similar levels of flow if their complexity grew significantly due to size, as is the case with Toyota. This dissertation does not consider the impact of growth on the ability to perform certain actions, and is a limitation of this study.

Main hypothesis

Evidence shows case one (manufacturing organisation), two and five (service organisations) and seven (in-between organisation) practise three out of four activities related to promoting flow, with the remaining cases practising less. Evidence, therefore, does not support the main hypothesis that the fundamental nature of the TPS will be found at manufacturing organisations, and by implication not at service organisations.

5.2.7 Increase process effectiveness and efficiency

An effective and efficient resource was judged to be *valuable*, *capable*, *available*, *adequate*, and *flexible* (see literature study, appendix D and G for elaboration and evidence).

Some ensuring that processes truly specify customer value – *valuable* (1/7)

Only one out of the seven cases showed evidence of ensuring processes specify and drive customer value. The low number of cases practising this activity may be explained by the higher individuality outcome of South African culture as opposed to Japanese culture. South Africans are less group-oriented than their Japanese counterparts, which could lessen the awareness of customer needs (Hofstede, 2003). Research methodology may also have played a role, as customers of the selected cases did not give input to the interviews, interactive presentation or structured observations, and some inconspicuous evidence may have been missed. Some lean purists will argue that without understanding customer value, one cannot claim to practise the Toyota Production System (Womack and Jones, 2003:10, 19, Liker, 2004:27, Bicheno 2004:10), which may make this an importing finding of the research.

Some maximising of capability through removing process waste – *capable* (4/7)

Four out of seven cases seemingly practise the above activity. This activity required that the selected cases have a systematic approach to ensure processes are capable of achieving their intended outcomes. The type of organisations (manufacturing vs. service) may explain the finding as three of the four cases practicing this activity are involved with manufacturing. The exception, case five, is a human resource consultancy. They had created a role that specifically looks at the capability of their processes.

The remaining cases where no evidence was found for this activity are all service or in-between organisations. Case two may be less dependent upon highly capable processes, as they are highly-labour intensive and use highly-skilled labour. Case four and case seven would, however, be dependent upon the capability of their processes and it is puzzling why no evidence was found to support the presence of this activity in their organisations. Potentially, the research instrument may have missed some evidence. Alternatively, as franchise organisations, their focus on capability may be imbedded in the recipe they replicate, and less evident.

Some ensuring a process or resource is available when required – *available* (4/7)

Four of the seven organisations that participated in the study had evidence of a focused process to improve *availability* of resources.

For the organisations where no evidence was found showing this activity takes place:

- Two are service organisations and their product offering may not be dependent upon shop floor resource effectiveness, possibly explaining a lack of evidence in this area (case two and five).
- Case seven will be dependent on kitchen equipment availability, so the lack of evidence of a focus on availability here is surprising.

Further research may be required to define and measure resource availability in pure service organisations like case two and five, as resource availability for them is closely linked to the state of mind of their human resources.

Some acquiring processes and resources of adequate value-stream capacity – *adequate* (2/7)

The lack of evidence for the *adequate* activity is puzzling given the limited ability of the selected cases to invest in large resources covering multiple products due to potentially less access to capital (barring case three). Intuitively, small and medium-sized organisations like the selected cases would have more tailor-made solutions covering only, or exactly, what the customer needs.

On closer examination, the similar number of cases found practising the activities related to valuable, adequate (see above, appendix D and G), and flexible (see the subsequent section, appendix D and G) might be linked. If the cases involved in the study have a limited focus on what drives customer value then they would not be able to procure or install resources that are exactly right sized for the value that the customer requires. In addition, Toyota's focus on flexibility is more towards being flexible to changing, or low customer demand, and not necessarily towards making a wide array of products on one line, which would be the opposite of the TPS (Ohno, 1988: xiv, Liker, 2004:8; Ballé and Ballé 2005:179).

Some modification of processes or resources to quickly change over from one product to another – *flexible* (3/7)

Three of the seven cases had evidence in support of *flexible*. This is again surprising given the smaller size of the organisations participating – intuitively smaller organisations should be more agile than larger organisations and should more easily accommodate changes in customer demand and different product types.

However, studying the individual case contexts of those cases where no evidence was found may provide some insight:

- Case four has a manufacturing and franchising leg, and essentially sells a recipe to their franchisees in terms of the jewellery they will sell. 'Flexibility' and 'recipe' might be considered as contradicting.
- Case seven, also a franchise organisation, again sells a standard organisation format and fast food menu, and flexibility would be difficult to incorporate.
- Case five essentially sells a single product (placement of recruits), and their customers would not consider them for a different type of HR consulting service. They may simply therefore not have an incentive or need to be flexible.
- Case six's lack of evidence however remains a mystery as theoretically they operate like a job shop and should benefit from faster changeovers. Either the measuring instrument missed evidence, or another reason exists, which could be a topic of further study.

Other limitations

As suggested, the fact that the research methodology and data gathering approach did not include interviews with customers to gather their experiences of the selected cases is an important limitation.

Main hypothesis

Evidence showed case three to practise the largest number of activities, followed by case two and case one. Again, no differentiation between manufacturing and service organisations can be drawn, and the main hypothesis is not supported.

5.2.8 Standardise

To standardise in a similar way to the fundamental nature of the TPS, participating cases need to structure activities to a standard set of tasks, test whether standards are in place and have operators own and update standards.

All structuring to a standard set of tasks (7/7)

Using the word 'all' here and throughout the discussion should not be seen as 'always'. It should be seen that some evidence was found, the evidence not necessarily being representative of the way the selected cases *always* conduct their activities, and thus *sometimes* is regarded as sufficient for the purposes of this research document. From this

perspective it is then not surprising that evidence was found at all cases stating they (sometimes) standardise their activities.

No testing whether standards are in place (0/7)

The entire TPS is set up to expose exceptions to the standards that are in place, leading to daily improvement of standards. According to some authors this one of the most critical parts of the TPS. Toyota management actively test whether standards are in place, by going to Gemba, completing the PDCA cycle and asking questions like: 'How do you do this work? How do you know you are doing this work correctly? How do you know that the outcome is free of defects? What do you do if you have a problem?' (Spear and Bowen, 1999:99; Liker, 2004:225; Liker and Hoseus, 2008:149-151). Ohno believed no improvement can be done if standards are not followed (Ohno, 1988).

It is, therefore, an important finding to have no evidence supporting the activity 'test whether standards are in place' at the selected cases. Part of this may be explained by the position on the product-process lifecycle matrix, i.e., Toyota may be more dependent on strict adherence to standards as they manufacture a high volume of few products in a mature market. This requires them to break their standard tasks down into seconds of activity. Culturally, it may also be influenced by the higher outcomes Japanese culture have for *masculinity* and *uncertainty avoidance* as per the study of Hofstede (2001). A higher masculinity outcome will result in the organisation being less tolerant of deviation from rules and promoting mastery of even menial tasks, which will be supported by the use of standards (Hofstede, 2001:298). A higher uncertainty avoidance outcome means that employees will want more organisational rules to abide by and will be less likely to break them (Hofstede, 2001:160-161).

Some having operators own and update standards (4/7)

Four of the seven cases allowed lower level employees to own and update standards. Some reasons for this outcome are discussed. Firstly, seen in context of zero evidence found for testing whether standards are in place, it is potentially contradicting to find operators owning and updating standards without management testing standards adherence. As such, the evidence may not be a reflection of an attitude to have those who use standards own standards, but potentially the abdication of the creation and updating of standards by managers in these organisations to lower levels. Alternatively, the measuring instrument may have been too lenient when allowing evidence for this activity. Further research may shed light on this.

Other limitations

Potentially, the application of standards by the selected cases is superficial compared to the TPS. As such, a question arises whether a direct comparison is possible, and is potentially a limitation of this study:

- No evidence was found to support work strategies specified to below one minute.

- No standards were rolled out throughout participating organisations' departments or divisions. Selected cases sometimes used standards, but not always.
- On a spectrum between never and always using standards, Toyota is seemingly much closer to the always side than the selected cases participating in this study.

This disparity may be driven by their culture (e.g. the Japanese culture being less tolerant of uncertainty) or the position on the process and product lifecycle matrix of Hayes and Wheelwright (1979a), e.g. Toyota making larger volumes of fewer parts which are easier to standardise. Further research could shed light on this.

Main hypothesis

Evidence show cases one, two, five and six practise two out of three activities, with the remaining cases practicing only one out of three activities. Evidence therefore does not support the main hypothesis. Not only is the fundamental nature of the TPS not found to the full extent in the manufacturing organisations, but also service organisations participating in this study showcase the same or a larger number of activities than some of the manufacturing organisations.

5.2.9 Formalise industrial engineering

Toyota places a high value on the organisation's efficiency, viewing it as crucial to their long term success (Toyota, 2009a:2, 28; Toyota, 2008a:14; Toyota 2007e:14; Toyota, 2007f; Ohno, 1988:18, 62). Their country of origin, Japan, was placed eighth in the world for global competitiveness in 2009 (World Economic Forum, 2009:182).

By contrast, South Africa was placed 45th in the world (World Economic Forum, 2009:282). In an economy where it is potentially more difficult to compete globally, high productivity may be essential for long term success. In this context, the following paragraphs comment on the question of how the selected cases compare with Toyota with regards to the TPS strategy to achieve high levels of efficiency.

As per the literature study, to have a similar strategy as Toyota, these organisations would need to systematically reduce waste, evident through reduced work content and reduced variation. Such waste reduction activities would need to be prioritised, and translate into cost reduction. Lastly, they would need to optimise operational methods and layouts to enhance human performance.

Some installing a process for facilitated, radical improvement (4/7)

Although all cases had evidence of waste reduction, a systematic facilitated approach to eliminate waste (i.e., a structured attempt to reduce work content and variation) was not evident throughout. For the cases where no evidence was found, explanations may include the following:

- It could potentially be a maturity or experience gap.

- Different positions on the product-process lifecycle matrix (Hayes and Wheelwright, 1979a) could lead to different standardisation requirements, i.e., the larger the volume of a few select products, the more an organisation will be able to, and need to, have a structured approach to reduce work content and variation.
- The measuring instrument may have missed or misinterpreted some evidence

Further study is suggested to unpack this phenomenon.

No profitable industrial engineering departments (0/7)

Ohno had strong views on Toyota's approach to industrial engineering – suggesting that all efforts aimed at increasing productivity but not increased profitability is meaningless (1988:18, 71-72,126). The nuance here may be very important. If improvement is based on management perception, it could lose its scientific edge, however if it is tied to financial impact, improvement projects with the biggest potential impact will take preference. Spear and Bowen (1999:99) suggest the scientific approach by Toyota is one of the aspects that differentiate the success of their production system from other approaches.

Cultural differences may explain the lack of evidence for this activity, with higher outcomes in masculinity on the Hofstede cultural analysis leading to higher mastery of improvement activities, therefore, tying it to financial impact (2001:298). Alternatively, the data gathering methods may have excluded other sources of evidence that could point to explicit tying of improvement activities to financial impact, e.g. board meeting notes or annual reports. Regardless, further study is suggested to understand why the selected cases do not tie their improvement activities explicitly to profit making.

Some emphasis on methods and layouts optimised for human performance (6/7)

Six of the seven cases had evidence to suggest they emphasise optimal methods and layouts. Given that only four had a systematic approach to waste reduction; it may be odd that such a high number of cases present evidence for this activity. Studying the detail context of cases that did not show evidence for a systematic approach to reduce waste (case two and six) but did show evidence of emphasising methods and layouts optimised for human performance may provide some insight:

- Case two as a HR consulting organisation, employs mostly professional industrial psychologists, which could explain an emphasis on optimal methods given the highly trained staff compliment.
- Case six had been receiving pro-bono support from a group of lean enthusiasts, studying their methods and layouts, which could explain their emphasis on optimal methods and layouts despite not having a structured approach to waste reduction.

Other limitations

Although six of the seven cases conducted activities to optimise their methods and layouts to improve and facilitate productivity, the evidence pointed more towards larger scale layout or methods optimisation than detailed methods engineering and methods improvement. This dissertation considered and accepted this evidence as pointing towards the presence of the TPS activity of emphasizing methods and layouts optimised for human performance. This is potentially limiting, and further research taking the relative position of organisations on the product-process lifecycle matrix of Hayes and Wheelwright (1979a) is suggested.

Main hypothesis

Case four practices none of the activities, and remaining cases between one and two out of three activities. The main hypothesis is therefore not supported as the fundamental nature of the TPS is not found to its full extent in the manufacturing organisations. In addition, service organisations practise only slightly less of the activities than manufacturing organisations.

5.2.10 Create intelligent processes

The literature showed that an organisation that *creates intelligent processes* is one that prevents errors or damage before they occur through adding intelligence to their systems. If errors or damage should occur, such organisations have systems that hold specific people responsible to add the necessary intelligence to the system to prevent the error or damage from occurring again.

Some stopping of a process before damage can be done (4/7)

Four of the seven cases showed evidence of stopping a process before damage could be done. Various triggers, ranging from financial controls to the voice of the customer were used to avoid errors. However, none of the triggers were as immediate as the TPS principle of operators having an Andon cord at hand that they can pull to stop the line. Differences in the relative position on the product process and service process matrices as presented in Schmenner (1987) and Hayes and Wheelwright (1979a) of the selected cases as compared with Toyota may justify using this evidence as comparable:

- The manufacturing organisations participating in this study manufacture smaller numbers of a larger variety of products, with less automation. Most of the products they manufacture are not manufactured on a line, thus not allowing for the use of Andon cords.
- The service organisations participating in this study have a high degree of labour intensity (compared to Toyota's low degree). Their processes are therefore not automated but dependent upon the professional training of e.g. industrial psychologists, which also does not allow the use of Andon cords.

Some ensuring of specific accountability to solve problems (2/7)

Case four and six showed evidence of specific accountability to solve problems. In both cases, the evidence refers to an operator receiving immediate response from a manager when he or she raises an issue. Some thoughts to consider include the following:

- Specific accountability is perhaps easier for smaller organisations like case four and six.
- If this is true, however, then similar evidence should be in place for case five, where the team is essentially co-located with management or in very close proximity. Numerous reasons exist why no evidence was found for this at case five, including a potential shortfall in the measuring instrument. Further study could illuminate these.
- For the production organisations (case one and case three) it is surprising not to find this strategy present, as it could be associated with good management practise. The lack of evidence could either be because such accountability does not exist, gaps in the measuring instrument, or culture -
 - the high outcome in masculinity on the Hofstede cultural analysis suggest Toyota employees seek challenge and recognition in their jobs as opposed to harmonious relationships – which makes the assignment of specific accountability easier (Hofstede, 2001:298); and,
 - South African culture would tend to avoid conflict, making it difficult for management to assign specific accountability (Hofstede, 2001:298).

Some implementation of devices to prevent future occurrences of the problem (5/7)

Autonomation, of which error avoidance or Poka Yoke is part, is according to Ohno one of the pillars of the TPS (Ohno, 1989:6; Liker, 2004:129-130; Womack and Jones, 2003:231). Two thoughts to consider:

- Because none of the cases run their operations 'Just-in-Time', it takes away some of the pressure to ensure errors are avoided, as inventory can be used as a buffer to compensate (be it in human or physical resources).
- The number of cases found implementing error-avoidance devices may be relatively high as there should be less pressure to implement such devices, given the absence of a Just in Time system. Potentially the measuring instrument was too lenient, or else another reason for the implementation of such devices exists. Further research is suggested to explain this phenomenon.

Other limitations

Other limitations to consider include the following:

- A question that has not been fully answered is whether the selected cases (where evidence was found) empowered their workforce to own and fix processes they were involved with, or whether the evidence tended towards a disempowered workforce

raising issues with management in general, perhaps refusing to take responsibility. Understanding this context may help to further illuminate evidence used for this dissertation.

- The activity of creating intelligent processes is perhaps very sensitive to the relative position of an organisation on the product-process matrix of Hayes and Wheelwright (1979a:135) as compared with Toyota. A line with a large number of products being manufactured daily (typical for the TPS) may make better use of error avoidance devices than an organisation that makes a small number of a wide variety of products. Further research may help to better understand the application of error avoidance across different positions on the product process matrix.
- Culturally, the impact of higher uncertainty avoidance and higher masculinity outcomes of Japanese culture as compared with South African culture (Hofstede, 2001), may result in the strategy of adding intelligence to processes being more culturally accepted in Japan. However, evidence shows fairly wide application of some activities that inform this TPS strategy at participating organisations. It may be useful to understand what drives this acceptance in South African firms, something this dissertation has not considered.

Main hypothesis

Case one, two, four and six all practise two out of three activities that inform *create intelligent processes*. The remaining cases practise one out of three activities. Again, the evidence does not support the main hypothesis, i.e. that the fundamental nature of the TPS is found in manufacturing organisations, neither is differentiation between maintenance and service organisations possible.

5.2.11 Balance resources

To balance resources the Toyota Way, the selected cases would need to level demand and actively balance tasks through using standard work and TAKT time; separate rework from normal production and achieve balance between make to order and make to stock to enhance process balance.

Some fitment of customer demand to a level schedule (3/7)

Intuitively, the cases that would show evidence for fitting of customer demand to a level schedule should be the manufacturing organisations, i.e. case one and three. However, the evidence shows case two, four and seven attempting to fit demand to a level schedule:

- Case two sometimes assembles all managers to reassign roles and responsibilities, and otherwise they use informal team self-balancing.
- Case four's use of the number of diamonds to set to balance schedule seems to be a simple yet effective approach to obtain balance.

- Case seven uses more complicated forecast models based on output history.

The next paragraph discusses why 'fit customer demand into a level schedule' may be absent from the remaining service and production organisations, apart from the measuring instrument potentially missing some evidence:

- Service organisations (case five): Schemmer's (1987) suggested management challenges positions case two and five as professional service organisations and suggests they will face a challenge to schedule workforces. Toyota, which would be closer to a service shop (for the parts of their organisation that function as a service organisation) rather has a challenge to schedule demand than workforces.
- Manufacturing organisations (case one, three and six): similarly to the service organisations, Schmenner (1987) suggests scheduling as a management challenge for organisations of job shop and batch flow organisations, but not for line flow organisations like Toyota.

Potentially, cases one, two, three, five and six have not yet overcome the challenge of scheduling in their respective organisations.

Some use of standard work and TAKT time (3/7)

Case one, two and three use some standard work with timed strategies to drive their operations. However, the use of TAKT time, i.e., driving the manufacturing to a rhythm obtained by dividing available time with customer demand, was not observed. This discrepancy may be explained by the different position on the product-process lifecycle matrix of Hayes and Wheelwright (1979a). As Toyota manufactures larger volumes of fewer products than the selected cases (although case one and three are also regarded as high-volume manufacturers), it may make it more difficult to implement the use of standard work coupled with TAKT time at the selected cases. Further study is suggested to understand the implementation of this principle in organisations that manufacture smaller quantities of a larger variety of products; and implementation in service organisations. Excluding case two, the remaining cases are even more dissimilar to Toyota than case one and three, if they are positioned using Hayes and Wheelwright's (1979a) and Schmenner's (1987) matrices. This may make the use of standard work and TAKT time potentially less appropriate, which may explain why no evidence was found at these cases.

No separation of rework from normal production (0/7)

A number of potential explanations why no evidence was found are discussed:

- Firstly, it may again be due to the relative position of the selected cases as compared with Toyota on the product-process lifecycle matrix of Hayes and Wheelwright (1979a:135). When multiple products are manufactured in smaller quantities, the duplication of skills required to separate rework from normal production may not be economically viable. However, Toyota suggests the team leader normally conduct this,

to ensure he or she also takes responsibility to fix the root cause (Ballé and Ballé, 2005:83).

- Secondly, it may be due to cultural differences between South Africans and Japanese. However, the higher individuality outcome of South African culture potentially goes against this, as South Africans are more likely than Japanese to break the group set up and separate what needs to be fixed away from the group (Hofstede, 2003).
- Thirdly, research methodology and data gathering techniques may have missed some evidence of how this is done. This may especially be true for the service organisations, as it would be more difficult to spot managers taking responsibility to correct rework. For the manufacturing organisations, if rework was separated from normal production, it would have been clearly visible as a different location would have to be used on the shop floor.
- Fourthly, it could be logic or skill difference between the selected cases and Toyota, as understanding the rationale for separating rework from production is not apparent unless one runs standard work and TAKT time and balance resources based on standard work strategies. Only then it becomes obvious that within one TAKT time cycle, an operator will not be able to fix a rejected product and continue to build a normal product if the line is balanced, which makes sense for the manager to then take responsibility to fix that product.

Some equilibrium between make to order and make to stock (3/7)

The manufacturing organisations (case one, three and six) all found some equilibrium through the use of supermarkets, which is in line with the way Toyota obtains balance in their operations. The research methodology and approach may have discriminated here against the organisations not involved with pure manufacturing. Further study would be required to understand how service organisations obtain balance in manufacturing between keeping inventory (e.g., additional consultants in case two's context) and running a pure make to order environment without any buffer, which becomes a limitation of this study.

Other limitations

It seems the different position on the product-process lifecycle matrix of Hayes and Wheelwright (1979a:135) may have significant influence when implementing an approach to balance resources. As such, the comparison between organisations occupying different positions may not be ideal when considering an approach to balance resources, which becomes a limitation of this study.

Main hypothesis

Evidence found does not support the main hypothesis. Firstly, the fundamental nature of the TPS is not found in the manufacturing organisations (only two out of four activities that inform

the strategy are practised). Secondly, case two as a service organisation also practices two out of four activities; hence no differentiation may be made.

5.2.12 Enable visual management

To practise the Toyota strategy of visual management, organisations would need to have similar actions, disciplines, or perhaps outcomes as Toyota. The actions or disciplines Toyota practices to obtain a self-explaining, self-ordering and self-improving workplace are separate, set in order, set countermeasures and, sustain.

Some 'separate' (3/7)

Case one, two, and three all had evidence of sorting valuable from less valuable activity and making it visible. The presence of this activity at case one and three makes sense as they have both been exposed to lean improvement tools and have use this for housekeeping. Case two's practising of this activity is a bit puzzling. The evidence that was considered was the implementation of a new budgeting system that allowed management to zone in on specifics of projects (where formally information was not sorted and they had difficulty using it for decision making). Although this dissertation regarded it as 'some evidence', it may potentially be the exception, and not the rule at their organisation.

If the evidence from case two is excluded, the different type of manufacturing and different position on the product process matrix could explain the absence of evidence at case four, five, six, and seven. As these organisations' positions and types of product are even more different from Toyota than case one and three, it may imply that a rigorous approach to shop floor visual management is less applicable at the selected remaining cases.

All 'set in order' (7/7)

All cases showed evidence for set in order. A potential explanation is that normal management activity may necessarily result in more order being created (e.g. case two's standardised reports). One might in general always find evidence for 'set in order' wherever a management system is in place. 'A place for everything and everything in its place' is sometimes used to explain set in order, which emanates from the mid nineteenth century, before Toyota existed^{xvi}, which shows this activity is potentially universal and less about the TPS.

Some 'set countermeasures' (3/7)

The outcome of 'set countermeasures' is similar to 'separate' – evidence was found at case one, two, and three that supported the existence of this activity. Apart from a similar argument

^{xvi}This quote emanates from the early 19th century: 'There is as much meaning in the old adage, and the observance of which let me urge you as a remedy for every degree of evil I advert to – 'have a place for everything, and keep everything in its proper place" (Ohio Repository, Canton, Ohio, December 1827).

for 'set countermeasures' as with 'separate', the cultural differences between Japan and South Africa may play a role – the high outcome for uncertainty avoidance of Japanese infer that they feel a stronger need for clarity and structure (Hofstede, 2001:160-161), resulting in a stronger drive to ensure everything out of place is brought back into place.

No 'sustain' (0/7)

The lack of evidence for this activity may again be partially explained by the differences between Japanese and South African culture. As with 'set countermeasures', the high outcome for uncertainty avoidance of Japanese culture infers that they feel a need for clarity and structure (Hofstede, 2001:160-161). The high outcome for masculinity, when compared with South African culture, suggests Toyota would pursue high mastery vs. low mastery, of which sustaining and standardising would be part (Hofstede, 2001:298).

Other limitations

A seemingly significant limitation is again the types of product and processes employed, as evident on different positions of the selected cases and Toyota on the product-process lifecycle matrix of Hayes and Wheelwright (1979a:135), and service operations matrix (Schmenner, 1987). Further study is recommended to understand the impact required from visual management across different positions on these matrices.

5.2.13 Summary of limitations

A summary may now be drawn up of the major limitations of this study for each of the TPS Level One strategies:

Table 5-2: Highlights of limitations

TPS Level One strategy	Limitation
Increase customer value	▪ No interview of customers of the selected cases took place.
Organise by value-stream	▪ Assumption made that all cases can organise around value-streams.
Deploy policy	▪ Assumption that strategy can be deployed on a lower level if a higher level is missing.
Empower employees	▪ No historical or time series analysis to understand skills transfer.
Eliminate waste before it occurs	▪ Assumption that 'eliminate waste before it occurs' can be measured in a 'make to print' environment.
Promote flow	▪ The study compares small with large organisations.
Increase process effectiveness and efficiency	▪ No interview of customers of the selected cases took place.
Standardise	▪ The study compares small with large organisations.
Formalise industrial engineering	▪ The main focus of the study was on the fundamental nature of the TPS (Bateson Learning One / strategies)
Create intelligent processes	▪ The study compares organisations with different positions on the product-process lifecycle matrix.
Balance resources	▪ The study compares organisations with different positions on the product-process lifecycle matrix.
Enable visual management	▪ The study compares organisations with different positions on the product-process lifecycle matrix.

Given the outcome and limitation listed, it may be helpful to compare results given the selected cases' positions on the product-process matrix of Hayes and Wheelwright (1979a) and workforce culture compared to Toyota's:

5.2.14 Comparison of each case's highest scoring and lowest scoring activity to Schmenner's (1987) management challenges

Schmenner (1987) suggested occupying different positions on the product-process matrix as presented by Hayes and Wheelwright (1979a) will lead to different management challenges to overcome. An attempt is made to explain some of the high and low scoring strategies given the suggested management challenges –

- manufacturing organisations' management challenges are compared with case one, three, four, six and seven's strongest TPS Level One strategies;
- and service organisations' management challenges are compared with case two, four, five and seven's strongest TPS Level One strategies^{xvii}.

Table 5-3 maps the management challenges a manufacturing organisation would experience given their position on the product-process matrix to the highest and lowest scoring strategies of the selected manufacturing cases.

Table 5-3: Comparison of the highest and lowest TPS Level One outcome compared to Schmenner's management challenges for manufacturing organisations

Organisation (Consistent)	Schmenner's management challenges	TPS strategies with highest scores	TPS strategies with lowest scores
Case one	▪ Worker motivation ▪ Balance ▪ Maintaining enough flexibility ▪ Quality / product differentiation ▪ Flexibility in output volumes	▪ Promote Flow ▪ Enable visual management	▪ Empower employees
Case three	▪ Worker motivation, ▪ Balance, ▪ Maintaining enough flexibility ▪ Quality / product differentiation ▪ Flexibility in output volumes	▪ Enable visual management ▪ Increase process effectiveness and efficiency	▪ Deploy policy
Case four	▪ Scheduling ▪ Material handling ▪ Shifting bottlenecks ▪ Bidding ▪ Delivery ▪ Product design flexibility	▪ Eliminate waste before it occurs	▪ Deploy policy
Case six	▪ Scheduling ▪ Material handling ▪ Shifting bottlenecks ▪ Bidding ▪ Delivery ▪ Product design flexibility	▪ Create intelligent processes ▪ Standardise	▪ Deploy policy
Case seven	▪ Scheduling ▪ Material handling ▪ Shifting bottlenecks ▪ Bidding ▪ Delivery ▪ Product design flexibility	▪ Promote flow	▪ Increase process effectiveness and efficiency

^{xvii} Case four and seven are included in the service organisation comparison as they have substantial service operations as well.

Potentially, a link exists between the suggested management challenges experienced and the highest and lowest TPS Level One outcome (i.e. the highest and lowest number of activities practised for a given strategy) for some of the cases:

- Case one - the management challenge of maintaining enough flexibility may be eased by the TPS strategy of promoting flow. The management challenge of worker motivation may be evident in the low outcome for the 'empower employees' strategy. Potentially, case one has focused on creating flow, but has neglected worker motivation.
- Case three - the management challenges of quality and product differentiation will be eased by practising the TPS Level One strategy of 'Increase process effectiveness and efficiency'. Similarly, the management challenge of worker motivation may be evident in the low outcome of 'deploy policy', which could lead to demoralised workers.
- Case seven - the management challenge of shifting bottlenecks may be eased by practising the TPS Level One strategy of promoting flow.

No direct link is immediately apparent between case four and six's suggested management challenges and their TPS Level One outcome, and further study is suggested to understand this outcome.

Table 5-4 maps Schmenner's (1987) suggested management challenges for service organisations against their highest and lowest TPS Level One outcome:

Table 5-4: Comparison of the highest TPS Level One outcome compared to Schmenner's management challenges for service organisations

Organisation	Schmenner's management challenges	TPS strategies with highest scores	TPS strategies with lowest scores
Case two	▪ Hiring ▪ Training ▪ Methods development and control ▪ Employee welfare ▪ Scheduling workforces ▪ Control of often geographically spread locations ▪ Start-up of new units ▪ Managing growth ▪ Fighting cost increases ▪ Maintaining quality ▪ Reacting to customer intervention in process ▪ Managing advancement of people delivering service ▪ Managing flat hierarchy with loose subordinate-superior relationships ▪ Binding workers to the firm	▪ Promote flow ▪ Enable visual management	▪ Deploy policy
Case five		▪ Promote flow	▪ Increase customer value

Similar to manufacturing organisations, a potential link exists between the management challenges experienced and the highest and lowest TPS Level One or strategy outcome for some of the cases:

- Case two - promoting flow and enabling visual management will ease challenges related to cost (lower waste in processes, visual controls) and growth (use of visual standards leads to easier management). Challenges related to growth, geographically spread locations and advancement of people may be evident in not practising policy deployment.
- Case five - promoting flow will ease challenges related to cost (lower waste in processes).

5.2.15 Potential role of culture to explain zero evidence activities

Culture may play a role in understanding why no, or little, evidence was found for some TPS Level Zero activities. This discussion will re-examine the activities where no evidence was found for a general discussion around culture. The focus is specifically on where product-process differences may not explain its absence, but differences in Hofstede's cultural scores may.

As explained in the literature and methodology section, Toyota's culture is assumed to be informed by Japanese culture. Two major differences between Japanese and South African culture were highlighted, with Japanese culture having much higher scores for masculinity and uncertainty avoidance

Impact of the difference in masculinity score (Hofstede, 2001:298) -

- seek challenge and recognition in their jobs as supposed to harmonious relationships;
- prefer higher job stress as opposed to lower;
- allow work to take a central role in life space opposed to wanting more separation;
- pursues high mastery vs. low mastery; and,
- seek leadership and self-realisation above service.

Impact of the difference in uncertainty avoidance score (Hofstede, 2001:160-161) -

- tendency to stay with the same employer as opposed to less hesitation to change;
- prefer specialist to management positions;
- have an ideological preference for consultative management rather than authoritative management;
- believe that organisation rules may not be broken, even when necessary;
- believe what is different is dangerous;
- prefer to take only known risks;
- have a fear of, and respect for, older people; and,
- feel a need for clarity and structure.

A third aspect of culture, where Hofstede did not include South African culture in his comparison, is long-term orientation. Long-Term Orientation is an indication of the time horizon to which a society prescribes. If South African culture has a lower score than Japanese culture, it could explain some differences as well.

Taking these differences into account, table 5-5 is constructed around the cultural aspects that may explain the absence of a specific activity at the selected cases:

Table 5-5: Hofstede (2003) cultural aspects that may explain zero outcomes for some TPS Level Zero activities

TPS Level One strategy	TPS Level Zero activity with 0/7 outcome	Cultural aspect that may explain absence of activity, using Hofstede
Increase customer value	Add value to the customer throughout the lifecycle of the product	Long-term orientation (Toyota will view the relationship as longer term)
Organise by value-stream	Re-align vertical roles	Masculinity (Toyota management will pursue mastery)
Deploy policy	Continue to set stretching goals	Masculinity (Toyota employees will demand challenges and recognition)
Empower employees	Follow the Socratic Method Encourage voluntary self-study	Masculinity (Toyota employees will pursue mastery)
	Reward improvement	Masculinity (Toyota employees will demand challenges and recognition)
Eliminate waste before it occurs	Take the overall lifecycle into account	Long-term orientation (Toyota may view lifecycle from a longer term perspective)
Formalise industrial engineering	Let your industrial engineering department be profitable	Masculinity (Toyota employees will pursue mastery)
Enable visual management	Sustain	Uncertainty avoidance (Toyota employees will believe organisational rules may not be broken)

An attempt has also been made to compare the study's outcome given each case's competitive dimensions - please see Appendix M for this discussion.

5.2.16 Summary of limitations given management challenges and cultural differences

Table 5-6 summarises some of the limitations that may exist due to interrelationships caused by management challenges faced and cultural differences between South Africa and Japan.

Table 5-6: Summary of potential interrelationships and limitations given management challenges and cultural differences

Category	Potential interrelationship	Potential limitation
Schmenner's management challenges	Link may exist between Schmenner's suggested management challenges experienced and the highest and lowest TPS Level One outcome / score	Management challenges faced may have a significant impact on the selection and application of TPS Level One type strategies
Culture	Links seems to exist between the lower masculinity score of South African culture and some activities not practised Link seems to exist between the lower uncertainty avoidance score of South African culture and some activities not practised Potentially, the strong long-term orientation of Japanese culture informs some of the strategies of the TPS	- The link between strategies employed and culture may have a significant impact on the outcome of this comparison - Hofstede did not compare long-term orientation for South African culture, which may have a significant impact on some strategies chosen

Given a discussion on individual case level and cross-case, the overall results are discussed.

5.3 Potential deficiencies requiring further research

Potential deficiencies requiring further research are discussed along with the major assumptions stated in chapter one, the methodology followed, issues highlighted during comparison of the twelve TPS Level One strategies and inter-relationships given case selection and culture.

5.3.1 Major assumptions

Table 5-7 suggests further research to address potential deficiencies given major assumptions as stated in chapter one:

Table 5-7: Suggestions for further research given major assumptions

Major assumption	Suggestion for further research
▪ This study is limited to the selected cases, and excludes their customers and suppliers. ▪ The fundamental nature of the TPS is described by studying a selection from the body of knowledge that is written about Lean Manufacturing and Toyota. ▪ The study assumes limited interdependencies when searching for evidence of the fundamental nature of the TPS. ▪ Searching for evidence of the fundamental nature of the TPS at selected cases assumes these strategies are useful to the selected organisations^{xviii}. ▪ Selection criteria for participating cases included organisation type, competitive dimensions, and product-process combinations. ▪ No historical or time series analysis was conducted to obtain a view over time.	▪ Include customers and suppliers as a data source to inform use of strategies. ▪ Create a framework solely based on observations of Toyota's operations, and compare results. ▪ Incorporate a greater number of interdependencies, e.g. political or economical landscape, education levels, language, etc. ▪ Construct a framework that de-selects some strategies of the fundamental nature of the TPS based on applicability or usefulness. ▪ Use different selection criteria and compare outcome of study to test its influence. ▪ Incorporate a longitudinal view of data and compare results.

5.3.2 Methodology

Table 5-1 summarised the major limitations given the methodology. Building on that table, further research that may address the deficiencies is suggested:

^{xviii} This may be seen selected cases all practising substantially less of the activities of the fundamental nature of the TPS than Toyota – see section 5.3.1

Table 5-8: Further research suggested given potential deficiencies in the methodology

Category	Potential concern	Further research suggested
<u>Approach</u>		
Research questions	Simple questions used	Refine research questions (e.g. focus specifically on high levels or on one segment of the product-process matrix of Hayes and Wheelwright (1979a).
Scope	Idiosyncratic approach	Narrow the scope to one segment of the product-process matrix of Hayes and Wheelwright (1979a).
<u>Design</u>		
Case selection	Great variety of cases selected	Narrow the scope to one segment of the product-process matrix of Hayes and Wheelwright (1979a).
Controlling for culture	Base case not conducted at Toyota	Test the suggested model at Toyota Japan and Toyota South Africa.
Analysis	Varying activities per strategy	Change measuring approach to the next level of detail, e.g. TPS activities.
<u>Validation</u>		
Construct validity	New model and protocol designed	Use Liker's (2004) or Womack and Jones' (2003) principles to design a protocol.
Reliability	Exploratory, qualitative case study approach	Change research design to use other methods, e.g. surveys and compare results.
<u>Preparation and Gathering</u>		
Interactive feedback	Objectivity of attendees	- Increase the sample size, number of attendees, data sources. - Test data for objectivity.
Interviews	'Lean' jargon in use	Study the impact of lean jargon on organisations' ability to fake implementation of TPS strategies.
	Prior attendance of the interactive presentation	Compare results of cases where no prior attendance of a presentation took place with this study's results, and test for objectivity.
	Selection of candidates	Employ random selection (not voluntary) of candidates and compare with the outcome of this study.
Structured observations	Focus on problem solving	Include other topics of discussion in the interviews and compare with the results of this study.
	Cross-sectional view	Study the application of TPS strategies over time and compare with the results of this study.
	Focus on shop-floor areas of manufacturing organisations	Conduct structured observations in office or service areas of manufacturing organisations who participated in this study and compare with overall results.

5.3.3 Comparison of the twelve TPS Level One strategies

Table 5-2 summarised the major limitations found when comparing the twelve TPS Level One strategies with the fundamental nature of the TPS. Table 5-9 suggests further research that may address deficiencies noted earlier:

Table 5-9: Questions to consider for further research for each TPS Level One strategy

TPS Level One strategy	Potential questions for further study
Increase customer value	▪ How big a role does the 'voice of the customer' play at selected cases?
Organise by value-stream	▪ When does it become viable to organise an organisation around customer value-streams?
Deploy policy	▪ What strategies other than 'increase customer value' will fit with the TPS?
Empower employees	▪ What training methods other than Socrates' will be effective in South Africa?
Eliminate waste before it occurs	▪ What is the impact of SA's skills deficit on the design proficiency of SA organisations?
Promote flow	▪ What does 'flow' look like along different positions on the product-process lifecycle matrix?
Increase process effectiveness and efficiency	▪ Is 'ensure processes truly specify customer value' a make or break test when comparing organisations to the TPS?
Standardise	▪ What does the application of standards mean along different positions on the product-process lifecycle matrix?
Formalise industrial engineering	▪ What does detail methods engineering mean along different positions on the product-process lifecycle matrix?
Create intelligent processes	▪ How can organisations in South Africa empower their workforce through coaching?
Balance resources	▪ What does standard work combined with TAKT time mean along different positions on the product/process lifecycle matrix?
Enable visual management	▪ What does visual management mean along different positions on the product/process lifecycle matrix?

5.3.4 Inter-relationships given case selection and culture

There may be some limitations given case selection criteria and culture. Table 5-10 suggests further research that may address deficiencies:

Table 5-10: Further research that may address deficiencies due to inter-relationships in case selection criteria and culture

Category	Interrelationship	Suggested further research
Product-process combinations	Differences between Toyota and selected manufacturing cases may explain the absence of some activities (also see Appendix L).	- Design a method to de-select some strategies based on product-process combinations and then re-compare results. - Obtain a method to relate the amount of activities practised by service organisations to product-process combinations of Toyota.
	Link may exist between Schmenner's suggested management challenges experienced and the highest and lowest TPS Level One outcome.	Explore the impact that management challenges faced may have on the selection and application of TPS Level One type strategies.
Culture	Links seem to exist between the lower masculinity score of South African culture and some activities not practised. Link seems to exist between the lower uncertainty avoidance score of South African culture and some activities not practised. Potentially, the strong long-term orientation of Japanese culture informs some of the strategies of the TPS.	- Design a method to translate the impact of culture on the TPS Level One type strategy selection, then redesign the measuring instrument to take this into account and re-compare selected cases. - Find an alternative for Hofstede's long-term orientation measurement and understand impact on South African strategy selection.

5.3.5 Interrelationships given product-process differences

The biggest differences between organisations closer and further away from Toyota on Hayes and Wheelwright's (1979a) matrix, is found in the strategies of 'Deploy policy', 'Increase process effectiveness and efficiency', and 'Enable visual management' (See Appendix L). An explanation for this is not immediately apparent, and is a suggestion for further research.

5.4 Overall study result

This section discusses the overall outcome of the study. A general discussion takes place to answer the main research question; followed by a high level comparison given product-process differences based on the product process lifecycle matrix of Hayes and Wheelwright (1979a).

5.4.1 General discussion - comparison of the total amount of activities practised at each case to answer the main research question

To answer the main research question, the total number of activities for which some evidence was found against the total for the TPS is compared, i.e. the tally out of 48. Table 5-11 shows the results for each case as well as the average that was found:

Table 5-11: Overall study results

Case:	Manufacturing organisations					Service organisations		Average
	One	Three	Four	Six	Seven	Two	Five	
Grand Total	24	23	15	20	18	28	20	21/48

The aim of the research is to explore the question: How prevalent is the fundamental nature of the TPS in selected South African organisations? The main hypothesis is that the fundamental nature of the TPS will be found in all selected manufacturing organisations (i.e. case one, three, four, six and seven), and by implication not at the selected service organisations (i.e. case two and five).

This dissertation interprets the statement 'will be found' to imply full compliance, i.e. evidence should indicate the presence of the fundamental nature of TPS in its entirety. This implies that some evidence will be found for all the activities^{xix} that inform the fundamental nature or strategies of the TPS. The main hypothesis is broken down into sub-hypotheses, with the same argument for each strategy of the TPS -

- some evidence will be found for all the activities that inform a particular TPS strategy at the selected manufacturing organisations (literal replication); and,

^{xix} This dissertation interpreted the fundamental nature of the TPS as the strategies of the TPS, or TPS Level One. However, the presence or absence of the strategies of the TPS is informed by measuring the presence or absence of a lower level, i.e. TPS Level Zero or the activities of the TPS. For more information on this particular aspect of the theoretical framework, see section 2.5.4.

- no evidence will be found for any of the activities that inform a particular TPS strategy at the selected service organisations (theoretical replication).

Table 5-11 shows that, given the limitations discussed in section 5.2, the main hypothesis is not supported by the data gathered

- all of the selected organisations practise substantially less of the activities of the fundamental nature of the TPS than does Toyota,
- none of the manufacturing organisations practise all of the activities that inform the strategies or fundamental nature of the TPS; and,
- both service organisations practise some of the activities that inform the fundamental nature of the TPS.

Similarly, the evidence also does not support the sub-hypotheses (see table 4-15 and section 5.2).

In summary, within the limitations and constraints highlighted, the twelve strategies that comprise the fundamental nature of the TPS are found

1. to be practised substantially less by the selected organisations other than Toyota;
2. to be practised to differing degrees;
3. to be practised the most and to a similar degree in overall result by the manufacturing organisations similar to Toyota^{xx} and the service organisations; and,
4. to be practiced the least in overall result by the manufacturing organisations substantially different to Toyota^{xi}, especially evident in the strategies 'deploy policy', 'Increase process effectiveness and efficiency', and 'enable visual management'.

The main hypothesis, i.e. that *the fundamental nature of the TPS will be found^{xi} in all selected manufacturing organisations*, is therefore not supported by the evidence gathered.

However, when results from the three types or groups of organisations from Hayes and Wheelwright's (1979a) matrix are compared, additional insights become apparent. These are discussed in the next section.

^{xx} As compared to the product-process life cycle matrix of Hayes and Wheelwright (1979a).

^{xi} This dissertation interprets the statement 'will be found' to imply full compliance, i.e. evidence should indicate the presence of the fundamental nature of TPS in its entirety.

5.4.2 Potential interrelationships given product-process differences and higher levels of the TPS model

Product-process differences

When comparing the three groups of organisations suggested earlier (high-volume manufacturers, low-volume manufacturers and service organisations), some additional insights become apparent. Table 5-12 shows the average amount of activities where some evidence was found for each of the groups (out of the 48 activities that inform the strategies of the TPS)

- Service organisations and high-volume manufacturers practise more of the activities that inform the fundamental nature of the TPS; and,
- Low-volume manufacturers practise fewer of these activities.

Table 5-12: Group results for each TPS Level One strategy

Strategy	Average scores			
	Toyota	1. Service	2. Manufacturing – high volumes	3. Manufacturing – low volumes
Grand total out of 48	48	23.5	23.5	17.7
Percentage compared to Toyota	100%	49%	49%	37%

This means that that the selected manufacturing organisations with a product-process mix close to that of Toyota are also closer to the fundamental nature of the TPS. This is in line with what Hayes and Wheelwright propose (1979a, 1979b), in that organisations will select strategies (including manufacturing strategy) based on the relative position on their product-process matrix (illustrated in figure 5-1).

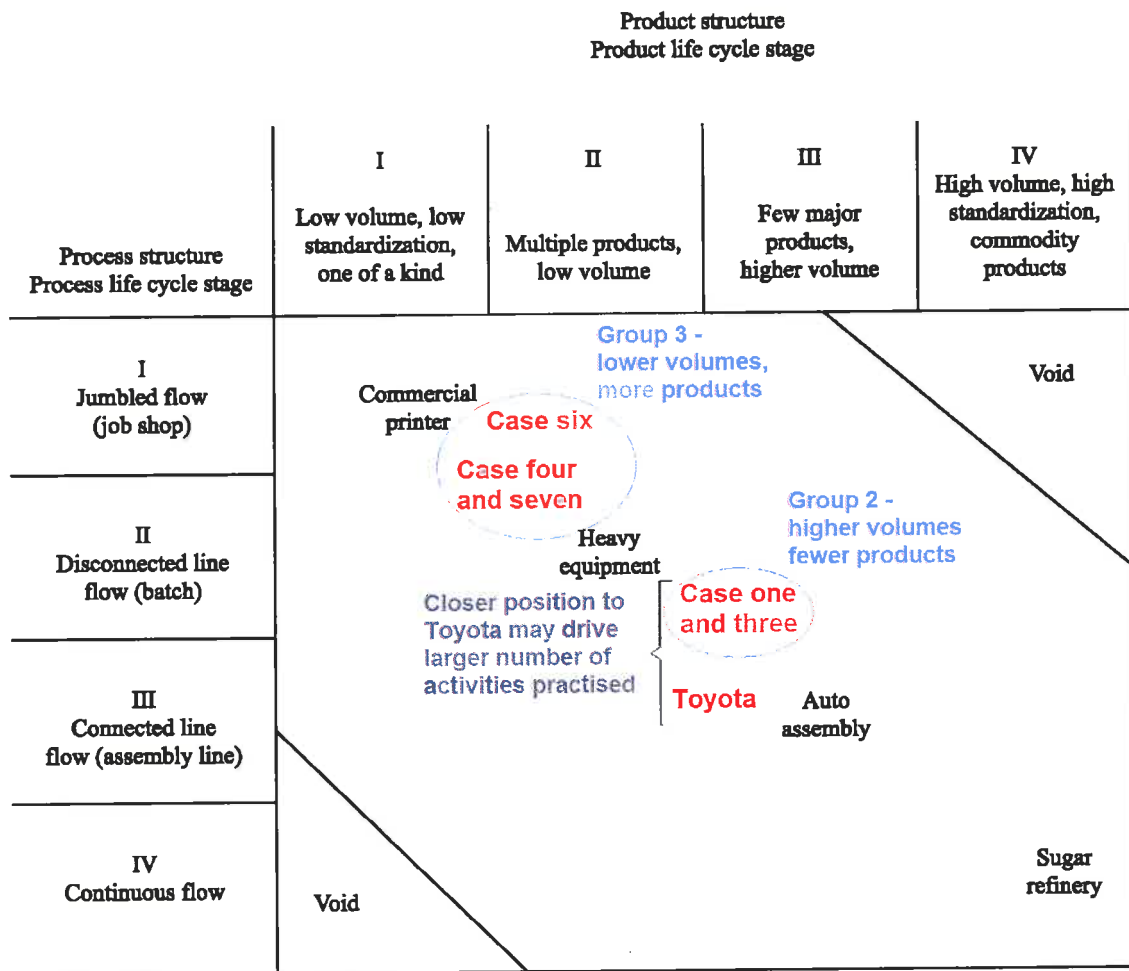


Figure 5-1: Product Process Matrix (Hayes and Wheelwright, 1979a:135) with potential interrelationship

The biggest differences between high-volume and low-volume manufacturers are found in the strategies 'deploy policy', 'increase process effectiveness and efficiency', and 'enable visual management'. For a discussion on variance in outcome or score for individual strategies and activities, please see Appendix L.

On the other hand, the high score for service organisations are not explained by Hayes and Wheelwright's (1979a) product process matrix. A discussion of the higher levels of the TPS model may shed some light on this.

Higher levels of the TPS model

Although the research questions refer to the fundamental nature of the TPS, i.e. the twelve strategies, information of the higher levels of the TPS model may be used to explain the research outcome. As shown in section 4.3, case two, a service organisation, had the most evidence supporting the presence of the higher levels of the TPS. Calculating the average scores for the three groups introduced earlier, shows that service organisations on average had

the most support for both *values* and *purpose* elements of the higher levels of the TPS model. This is driven particularly by the *values* of 'Teamwork' and 'Respect' and the *purpose* elements of 'Contribution' and 'Honour'. Figure 5-2 and 5-3 shows this visually (the different colours indicate the strength of support for each *Value* and *purpose* element)

Evidence found in support of TPS level two (values)

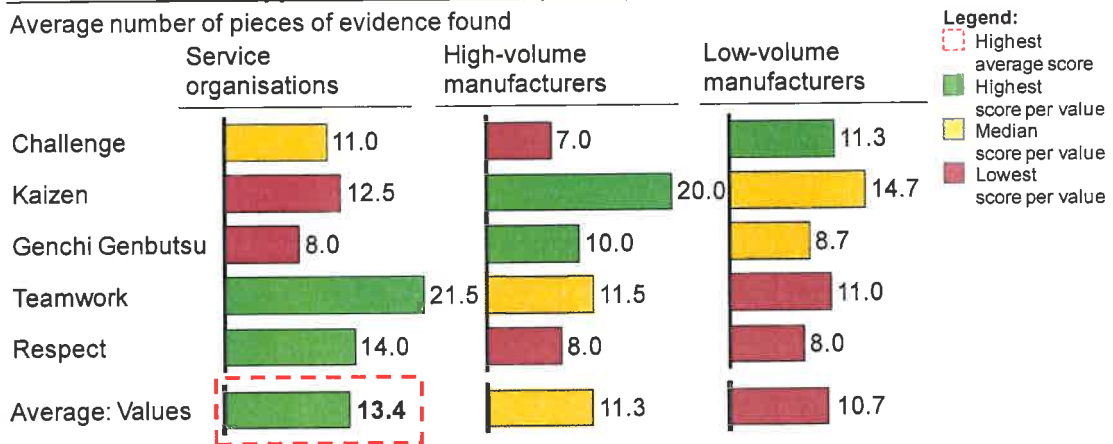


Figure 5-2: Number of pieces of evidence found in support of TPS Level Two (values)

Evidence found in support of TPS level three (purpose)

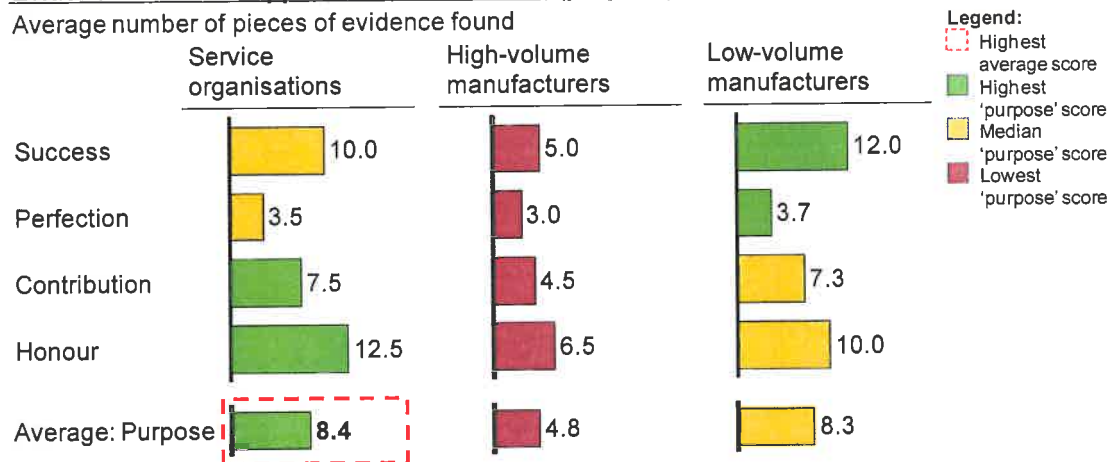


Figure 5-3: Number of pieces of evidence found in support of TPS Level Three (purpose)

The congruency for service organisations in a high score for both *values* and *purpose* is important, as Tosey (2006:8) argues people will always adjust their ways based on the metacommunication present – as it is 'partly subject to our conscious influence, is often non-verbal, and is complex because different levels of learning are **simultaneous** and **mutually influencing**'.

This perhaps explains why such strong support for TPS Level Zero and One was found at the selected service organisations (section 4.2.4). It also seems to confirm some of Brede's (1989) views discussed in the literature:

- higher levels contain information that explains the lower levels (1989:29),
- learning is part of the larger development context about which it informs and could increase the ability of application of other tasks in other contexts(1989:36-37); and,
- that higher order learning informs lower level processes, and the lower level processes helps 'compose' higher levels (1989:36-37).

For low-volume manufacturers, Tosey's (2006) view mentioned above potentially explains why, despite the relatively high support for *purpose* elements, there is no link to a similar score for TPS strategies and activities. Section 4.2.5 showed low-volume manufacturers had the most support compared to the other two groups for only for five of the 48 activities of the TPS. Low-volume manufacturers also showed the least support for the *values* of the TPS, hence there is no congruency between the higher two levels as with service organisations, and following Tosey, potentially no simultaneous and mutually integrated influence of the higher levels on the lower levels of the TPS model. This may also be seen in the absence of related support of the five activities where low-volume manufacturers had most support. Examples of this include strong support for 'Ensure specific accountability to add intelligence to processes', but almost no support for any of the activities associated with the strategy of 'Increase process effectiveness and efficiency'; and again strong support for 'Structure to a standard set of tasks', but almost no support with any of the 5S activities informing 'Enable visual management'.

Perhaps these explanations using the higher levels of the TPS show how Bateson (1972) can be applied to improve understanding of the application of the TPS in organisations.

5.5 Conclusion (results discussion and further research)

This chapter examined the implication of evidence discussed in the previous chapter by analysing the outcome of each activity that inform the twelve strategies of TPS Level One, and the overall implication for each strategy and the main research question and hypothesis. It discussed the methodology followed to reach this conclusion, and looked at the influence of different product-process combinations and culture, concluding with a summary of major limitations and suggested further research. It also showed how the outcome of higher levels of the TPS model potentially informs the outcome of lower levels.

The next chapter will draw a conclusion for this dissertation as a whole.

6 Overall conclusion

The purpose of this study is to examine the prevalence of the fundamental nature of the TPS in selected South African organisations. Many models endeavour to explain the Toyota Production System, e.g. Liker (2004)'s fourteen principles of the Toyota Way, or Womack and Jones (1996)'s five principles of Lean Thinking. However, some authors (Ballé et al, 2006; Johnson 2006) suggest that the successful and holistic understanding and implementation of the TPS requires a different approach. They suggest viewing the system from different perspectives, contexts, and levels is required, and propose the use of Bateson (1972)'s theory on learning to create such a view.

After studying existing models, this research followed Ballé et al's and Johnson's suggestion, attempting to construct a holistic model of the TPS using Bateson's theory of learning. The model consists of multiple levels, the highest of which is called 'purpose', followed by 'values', 'strategies', and the lowest being 'activities'. The 'strategy level' is suggested to capture the fundamental nature of the TPS, with the higher two levels (values and purpose) providing context, and the lowest level (activities) informing the strategies.

A simple set of research questions was drafted to facilitate the testing of the model and to answer the research questions, with the primary focus being on the lower levels. A study of the impact of culture and product-process combinations shed further light on the context under which the TPS operates, and on the requirements for comparing South African organisations.

A qualitative multiple-case study, using seven organisations, gathers data. Case selection followed the product-process matrix of Hayes and Wheelwright (1979a), and targeted three groups of cases, i.e. high-volume manufacturers, low-volume manufacturers and service organisations. A detailed protocol guided data gathering, and analysis follows a clustering and cross-case approach combined with pattern matching.

Within the limitations and constraints highlighted, the twelve strategies that comprise the fundamental nature of the TPS are found

1. to be practised substantially less by the selected organisations other than Toyota;
2. to be practised to differing degrees;
3. to be practised the most and to a similar degree in overall result when comparing high-volume manufactures and the service organisations; and,
4. to be practiced the least in overall result by low-volume manufacturers, especially evident in the strategies 'deploy policy', 'increase process effectiveness and efficiency', and 'enable visual management'.

The main hypothesis, i.e. that *the fundamental nature of the TPS will be found^{xxii} in all selected manufacturing organisations*, is therefore not supported by the evidence gathered.

This outcome raised mainly three points:

- The outcome (application of activities / strategies by selected cases) may be explained to some extent by product-process combinations and cultural comparisons.
 - Participating high-volume manufacturing organisations practice more of the TPS activities than participating low-volume manufacturing organisations.
 - Cultural comparisons between South Africa and Japan (using Hofstede, e.g. masculinity, power-distance) may explain the presence / absence of some TPS activities.
- Some outcomes however are surprising, and these cannot be explained by comparisons of product-process combinations or culture
 - Service organisations participating in the study performed on average the same amount of TPS activities as participating high-volume manufacturers.
 - Low-volume manufacturing organisations showed strong evidence for a select number of TPS activities, but some related activities showed no evidence.
- These differences may be explained by using higher dimensions of the author's TPS model (values and purpose), i.e. understanding the context in which these strategies / activities take place.
 - Service organisations participating in this study showed the strongest support for the higher levels of the TPS model – which could explain why they achieved a similar score as high-volume manufactures for lower levels of the TPS following Bredo's (1989) understanding of Bateson's (1972) theory of learning on which the model was based.
 - The lack of congruency of low-volume manufacturers in evidence for the higher levels of the TPS model may explain why there is not consistent support for related lower-level activities, following Tosey's (2006) understanding of Bateson's theory.

Part of the overall outcome may be simple and predictable (e.g. outcome when comparing with the product-process matrix), but part of this outcome shows the benefit of understanding the learning-context in which the TPS operates, as a potential way to explain the absence or presence of activities and strategies of the TPS not explained by either product-process combinations or culture. The multi-dimensional model of the TPS designed by this study may be used to augment existing 'lean' models that do not explicitly focus on the context (both learning and otherwise) in which the TPS operates, and further research is suggested in this field.

^{xxii} This dissertation interprets the statement 'will be found' to imply full compliance, i.e. evidence should indicate the presence of the fundamental nature of TPS in its entirety.

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8. Appendices

A. Tosey's motivation for using Bateson and explanations of Learning One, Two and Three

Tosey asserts 'only a framework such as Bateson's, which differentiates between logical types, enables us to understand organisational learning appropriately as multidimensional, paradoxical, and aesthetic'. He continues to say that Bateson's levels are a 'suitable framework' to use for capturing transformative learning. Tosey suggests Bateson's levels indicate a hierarchy more than recursion or nested loops (2006:4). Tosey gives two examples of how these levels have been portrayed by other authors – the first as loops stacked on top of one another, the second as nested loops. If nested loops were a good portrayal it would mean 'loops' occur simultaneously, not sequentially.

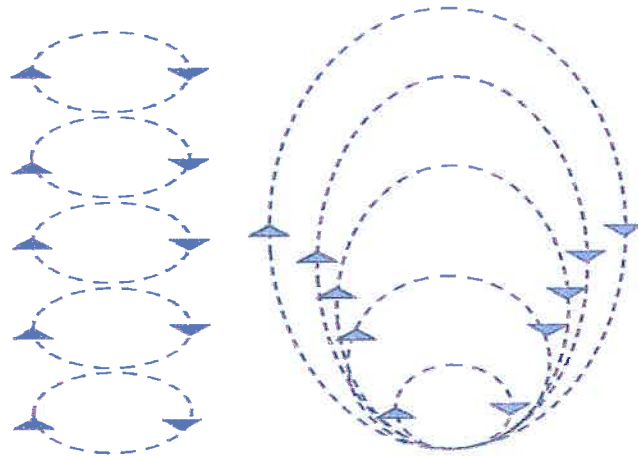


Figure A-1: Two ways to portray the levels of learning of Bateson – either as nested loops or as loops stacked on top of each other (2006:5,6)

Tosey describes Learning Zero as 'responding to stimuli but making no changes based on experience, or information'; Learning One as 'changes in knowledge, skill, and attitude ...' often refers to study skills' and on Learning Two as 'learning the pattern of context in which activity takes place'. Learning Two can also be compared to the 'tacit expectations and rules for success of formal educational contexts' as a 'hidden curriculum' (2006:7). Tosey suggests Learning Three takes place because of 'dilemmas of participation' that is similar to 'contraries generated at Learning Two'.

However, people have the potential to not learn, and as with Bateson's example of repeating our experience of authoritative figures as learnt in our families in the workplace, 'often we simply reproduce previously learnt patterns (Learning Zero)'. For Tosey, 'this also illustrates the point that Learning Two is not necessarily superior to or more beneficial than Learning One', as

early childhood reinforcement will probably be helpful as some stage (2006:8). He explains that Bateson's levels 'appear to involve enacted and embodied change in relations to contexts' (2006:10).

Tosey (2008:454) claims Bateson's ideas on learning 'not so much add to thinking about the learning organisation as turn it upside down'. Tosey credits Bateson with the concept of metacommunication: 'Gregory Bateson realised that when people or animals interact, communication happens on two levels simultaneously'. The implication of communication, which always includes a higher level of context, 'overturns the notion that 'learning' has a linear trajectory within a known context that is defined by managers', and includes managers as being part of the context able to influence an understanding about it (2008:455).

Another way he applies the work of Bateson is in viewing the Learning Organisation as a story, he states 'Bateson argues that stories convey patterns of meaning without attempting to unpack that meaning in an analytical way', and these stories 'are an example of the significance of the aesthetics of human systems. He also states 'Bateson's thinking remains significant but little understood' (2008:460).

B. Mapping selected cases against Hayes and Wheelwright (1979a) and Schmenner (1987)

Below follows a detailed mapping of the product-process combinations of the selected cases to the product-process matrix of Hayes and Wheelwright (1979a).

Process structure Process life cycle stage	Product structure Product life cycle stage			
	I Low volume, low standardization, one of a kind	II Multiple products, low volume	III Few major products, higher volume	IV High volume, high standardization, commodity products
I Jumbled flow (job shop)	Commercial printer	Heavy equipment	Auto assembly	Void
II Disconnected line flow (batch)				
III Connected line flow (assembly line)	Void			Sugar refinery
IV Continuous flow				

Figure B-1: Product Process Matrix (Hayes and Wheelwright, 1979a:135)

The different combinations may be positioned in tabular format:

Table B-1: Product-Process Matrix Application as Selection Criteria

Process, Product life cycle stage	Case that fits criteria
I) Jumbled flow, low volume	Case six
II) Disconnected line flow, multiple products and low volume	Some case one, some case three, case four, case seven
III) Connected line flow, few major products and higher volume	Some products of case one and case three
IV) Continuous flow, high volume, and high standardisation	None

Next, the positions on the service process matrix for selected cases that are service organisations are discussed.

		Degree of Contact with, and Customization for, the Consumer		Challenges for Management
		Low	High	
Degree of Labor Intensity	Low	The Service Factory Airlines, trucking, hotels, resorts, and recreation	The Service Shop Hospitals, auto, and other repair services	Capital decisions, technological advances, managing demand to avoid peaks and to promote off-peaks, scheduling delivery of service Hiring, training, methods development and control, employee welfare, scheduling workforces, control of often geographically spread locations, start-up of new units, managing growth
	High	Mass Service Retailing, wholesaling, schools	Professional Service Physicians, lawyers, accountants, architects	
Challenges for Management		Marketing, making service "warm," attention to physical surroundings, managing fairly rigid hierarchy with need for standard operating procedures	Fighting cost increases, maintaining quality, reacting to customer intervention in process, managing advancement of people delivering service, managing flat hierarchy with loose subordinate-superior relationships, binding workers to the firm	

Figure B-2: Service Processes Matrix and Related Challenges for Management (Schmenner, 1987:256)

As service organisations, Case two and Case five may be compared with the service process matrix.

Table B-2: Service process matrix application

Service-process position	Case that fits criteria
The Service Factory	None
The Service Shop	None
Mass Service	None
Professional Service	Case two, case five

C. Blank interactive presentation feedback form

Actions: 20 March 2009 - The fundamental nature of the Toyota Production System		
Purpose		Strategies
1		1
2		2
3		3
4		4
		5
		6
		7
		8
		9
		10
		11
		12
Values		Other comments
1		
2		
3		
4		
5		

Figure C-1: Blank interactive presentation feedback form

D. Results

The results in this section are positioned from a cross-case and not an individual case perspective as it allows the reader to more easily draw and cross-check conclusions around the prevalence or absence of TPS Level One strategies at participating organisations. The alternative would have been to present each case's results individually, but this may add unnecessary complexity as the reader would have to search seven different sections to compare a level one strategy.

When evidence is quoted, a 'P-', 'I-' or 'O-' with a number following will be seen. 'P-' represents evidence from the interactive presentation feedback, 'I-' represents evidence from the interviews and 'O-' represents evidence from the structured observations. The number following each dash represents the unique number for that piece of evidence as used in the database.

D.1 Cross-case analysis

D.1.1 Increase customer value

Increasing customer value for the purposes of this study is summarised according to four activities. The first is having a deep understanding of what the customer perceives as value (Bicheno, 2004:10; Womack and Jones, 2003:10,16,19), which includes using personal relationships as a vehicle to understand what the customer really values (Liker, 2004:177). The second activity is a discipline of rethinking core products to deliver upon what the customer views as valuable (Womack and Jones, 2003:32; Ballé and Ballé, 2005:28). The third activity is to scrutinise steps along the process to ensure maximum value add, or what the customer wants, as opposed to wasteful or unnecessary activities from the customer's perspective (Womack and Jones, 2003:97; Ballé and Ballé, 2005:85). Lastly value needs to be added to the customer throughout the lifecycle of the product (Liker and Hoseus, 2008:497, 498).

Understand the customer's perspective of value

Examples from the cases highlighting awareness of customer value include a focus or sensitivity towards cost as a driver of customer value (case one:I-10, case two:I-25); quality as a driver of customer value (case one:I-13, P-36); delivery reliability (case one: I-16, P-36; case two: P-79, P-86; case five:P-250; case seven: I- 117, I-123) and customer satisfaction (case two:P- 9; case four:I-57; case five:P- 83). A general 'sensitivity' around customer needs was found, i.e., the cases were aware that they needed to be in touch with what the customer perceives as value (case one:P-71; case two:P-16, P-233, P-261, P-72; case three:P-66; case four:P-123; case five:P-229; case seven:P-70). This sensitivity also included the internal customer (case three:P-80; case four:P-4; case seven: I-123).

Relationships were used as a method to understand what the customer values (case two:I-26; P-226,P-51,P-44,P-65; case five:I- 88, P-82; Case six:I-102, P-69), or being aware that this was an important approach to follow (case four:P- 179, P-74). Using relationships to deal with customer value was also evident in dealing with customer complaints (case four:I-56,I-57) or avoiding potential complaints or damage to the relationship (case five:I-86). Case seven first established whether a relationship will be viable before they approve an additional franchise to be sold (case seven:O-106).

Two suggestions that came from an interview with a manager of case seven, is that it will not be possible to provide a customer with real value whilst trying to 'be everything for everyone' (case seven: I-121); and that a virtuous circle results from providing customer value, attracting greater sales, and satisfaction (case seven:I- 124).

Re-engineer core products to improve customer value

An example of changing products after an understanding was developed of customer value was found in case five's development of a new product range after a request from a customer (case five:I-100). Case seven also practices target costing of their menu items after they have established what value will be for the customer (case seven:P-77).

Another example of changing products after a better understanding of customer value was obtained may be the experimentation of new menu items of case seven (I- 117, I-120, P-42) and ways to improve the overall customer experience (case seven:I-125).

Redefine organisation processes to increase customer value

Evidence from the cases that highlight a focus on the processes that deliver customer seems to be limited to an awareness of aspects that the customer is not willing to pay for (case two:I- 21; case five:P-41).

Add value to the customer throughout the lifecycle of the product

No evidence was found that suggested a lifecycle long approach to add value to the customer.

Summary

Table D-1: 'Increase customer value' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Understand the customer's perspective of value	S	S	S	S	S	S	S	7/7
Re-engineer core products to improve customer value	N	N	N	N	N	S	N	1/7
Redefine organisation processes to increase customer value	N	S	N	N	N	N	S	2/7
Add value to the customer throughout the lifecycle of the product	N	N	N	N	N	N	N	0/7
Total per case	1/4	2/4	1/4	1/4	1/4	2/4	2/4	--

Legend: S
N

Some evidence found to suggest activity is present
No evidence found to suggest activity is present

D.1.2 Organise by value-stream

The 'Organise by value stream' approach is a strategy to configure organisation units to facilitate the flow of value. It requires multi-disciplinary teams to be set up around value-streams or product families as opposed to functions of an organisation (Womack and Jones, 2003:256; Liker, 1994:178; Bicheno, 2004:11). It creates strong horizontal accountability, although this does not have to be formal (Womack and Jones, 2003:238; Dennis, 2007:91; Liker, 2004:63-64, 304). Lastly it requires the role of the vertical organisation to be technology and quality focused as directed by the needs of horizontal leadership (Liker, 2004:179,304; Womack and Jones, 2003:280).

Reconfigure teams to let value flow

Various examples of multi-disciplinary teams focusing on specific customer outcomes were found. Case one assembled a multi-disciplinary team to solve a specific problem plaguing one product family (I-11) and located all support functions for a specific product together (case one: O-16). Case two reorganises whole groups in their organisation due to changing customer demand around client managers or product managers (case two:I-20,I-26,P-345). Case three multi skills departments so that teams are not function oriented but product oriented, called integrated process teams (case three:I-47,P-339). Case four uses a multi-disciplinary design team for their jewellery (case four: O-71). Case five's small size allows them to function as one team with multi-tasking of functions across the team (case five:O-86, P-348). Case six organises their shop floor according to products and not manufacturing function (case six:O-99). Case seven organises their head office according to franchise product and not according to function (case seven:O-115).

Install horizontal accountability and leadership

Examples was found of strong horizontal leadership and accountability – case two organises their teams by client and installs client managers (case two:I-26). Case seven, by its very nature as a franchise organisation, install horizontal leadership given that a franchise owner serves a specific group of customers with the same product. In addition, case seven head offices are also set up according to franchise products and not organisation functions (case seven: O-115, I-119).

Realign vertical roles

No evidence was found to suggest a realignment of vertical roles due to a horizontal aligned organisational structure.

Summary

Table D-2: 'Organise by value stream' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Reconfigure teams to let value flow	S	S	S	S	S	S	S	7/7
Install horizontal accountability and leadership	N	S	N	N	N	N	S	2/7
Re-align vertical roles	N	N	N	N	N	N	N	0/7
Total per case	1/3	2/3	1/3	1/3	1/3	1/3	2/3	—

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.3 Deploy policy

The Toyota strategy of 'policy deployment' starts with senior management setting targets for the broader organisation based on the perceived customer need (Liker, 2004:219, 262, Dennis, 2006:37). These targets are then translated into stretching management goals for departments throughout the organisation, using tools like A3-reporting, performance dashboards, and Deming's PDCA cycle (Dennis, 2006:69; Liker, 2004:263). A further iteration is done to achieve detail worker plans per area, which becomes practical through kaizen events, daily problem solving and performance measures (Dennis 2006:20, 25, 129; Liker, 2004:219). These detail area plans, department and organisational goals are then regularly checked against plan and countermeasures taken where targets are not achieved (Dennis, 2006:43,137,141; Liker, 2004:262). Management continues to set stretching goals to drive continuous improvement (Womack and Jones, 2003: 95; Liker, 2004:262).

Set targets for the broader organisation

Case one, 2, and 7 had evidence of organisational goals – case one had a 'blue sky vision' in place, which form an overarching set of goals for the organisation, developed with the help of some of its clients (case one: O-23); case two had strategic planning sessions where they reviewed their overall strategy to achieve customer value (case two:O-42); and case seven set overarching targets for their franchises every year with regards to market penetration (case seven:P-406).

Set specific management goals

Case one had evidence of a monthly management meeting where performance of various departments are discussed in detail and some objectives are set (case one:O-22).

Create supporting plans to achieve management goals

Evidence for detail policy deployment was found at case two and 5: Case two has performance contracts for their employees (case two:P-234); case five have weekly accountability of their against performance targets, which influences their monthly strategy (case five:I-78, O-84).

Check progress to plan on a regular basis

Evidence to suggest regular checking of these goals was found case one, 3, and 5: Case one reviewed each department's achievement on a monthly basis (case one:O-22); case three had regular walkthroughs to discuss performance (case three:P-332), and case five reviewed the performance of their team members on a weekly basis (Case five: I-78).

Continue to set stretching goals

No evidence was found to suggest the continuous application of stretching goals once targets were met.

Summary

Table D-3: 'Deploy policy' Matrix

Main activity	Case one	Case two	Case three	Case four	Case 5	Case six	Case seven	Total
Set targets for the broader organization	S	S	N	N	N	N	S	3/7
Set management goals	S	N	N	N	N	N	N	1/7
Create supporting plans to achieve management goals	N	S	N	N	S	N	N	2/7
Check progress to plan on a regular basis	S	N	S	N	S	N	N	3/7
Continue to set stretching goals	N	N	N	N	N	N	N	0/7
Total per case	3/5	2/5	1/5	0/5	2/5	0/5	1/5	--

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.4 Empower employees

Toyota believes it is the responsibility of all employees to improve work-related skills and work ethic (Toyota, 2007b:57). A number of activities are practiced or encouraged to empower their workforce to achieve the abovementioned goals, and include the following: **Training on the outcome required** (Liker and Hoseus, 2008:127,133), **following the Socratic Method** facilitated by their use of standard work (Liker and Hoseus, 2008:111,119; Toyota, 2004e), **multi-skilling in value-stream tasks** (Ballé and Ballé, 2005:135; Liker and Hoseus, 2008:260; TSAM visit, 2008 and 2010), **coaching** (Toyota, 2007b:8; Liker and Hoseus, 2008:117; Womack and Jones, 2003:267; Spear and Bowen 1999:98) **voluntary self-study** (Liker and Hoseus, 2008:23, 116), **holding employees responsible** (Liker and Hoseus, 2008: 147, 260,

335; Ballé and Ballé, 2005:135); Womack and Jones, 2003:267; Spear and Bowen 1999:98) and **rewarding the workforce** (Bicheno 2004:146).

Evidence at the various selected cases suggested the presence of focusing on the outcome required, multi-skilling employees, coaching, and holding the workforce responsible.

Train on the task-outcome required

Case three initiated an improvement event aimed at skills development in an area where they experienced quality problems, and by focusing on the specific competencies required were able to significantly improve the quality (case three: I- 44). Case four could not afford diamond setters as their city was not a known jewel manufacturing centre in South Africa. They, therefore, started a skills development programme and trained their own jewellery setters, based on their unique purpose and application (case four:I-69).

Follow the Socratic Method

No evidence was found to suggest training follows the Socratic Method at any of the cases.

Train and multi-skill in value-stream tasks

Case one has a training and skills development department that is responsible for development of employees, with some units specifically focusing on tasks required by the product family (case one:O-30). Case two employees regard themselves as multi skilled (case two: P-408). Case three had a technician who was overloaded, so they trained the engineers and operators in the same department to also be able to conduct set ups and repairs (case three:I-47). Case five multi skills their employees on the tasks of recruitment and placing (case five: P- 411). Case six balances their teams through informal assignment (case six, O- 93). Case seven requires their kitchen staff to be skilled in some managerial activities (Case seven: O-108).

Ensure active mentoring and coaching

One of case two's employees experienced how the directors, after changing their focus, was able to provide much more regular input and time into her job (case two: I-32). A couple of case two employees also felt they are being mentored (case two: P-408, P-401). Case two also has small teams, which help to facilitate personal attention from the manager (case two:P-86). Case three implemented coaching to solve recurring quality problems (case three:I-44); and have small teams and flat structures (P-402). Some case four's employees have immediate access to managers if problems arise in their work (case four:O-75). Case five's employees are taught informally by their peers and superiors, supported by a small team set up (case five:O-82, O-85, O-87, P-117). Case five also coaches their candidates ahead of interviews (case five:P-110). Case six's functions on an apprenticeship model and employees meet regularly to coach each other and solve problems (case six:O-95,O-97). They also have easy access to management (case six:P-419).

Encourage voluntary self-study

No evidence was found to suggest voluntary self-study is encouraged at any of the cases.

Hold employees responsible to surface and solve problems

Case two directors involve their employees in strategic decision making (case two: I-26, O- 42) and recruits employees' opinions to improve the organisation (case two: O-46). Case two also allows some employees a lot of freedom to develop products – the example is where one consultant was given carte blanche in product development (case two:O-48). Some case two's employees believe they are responsible for operational decisions (case two:P-408). Case three's employees complained to management that watching machines did not allow them to practice their own thinking, so management partially automated a machine to give more intellectually challenging work to employees (case three:I- 55). Case three also gives employees responsibility and delegates decision making where possible (Case three: P-31,P-178). Case four allows their franchisees to make certain employment decisions that they were not allowed to do in the past (case four:I-59). Case five sets out clear goals for their employees and rewards them if they reach these goals (case five:I-77, O-81). Case six allows their employees to make technical changes to products without prior management approval when it is required to solve a problem (case six:P-411). A case seven franchisee allows their employees to balance kitchen work amongst themselves (case seven:O-108); and the franchisor again allows them to make certain marketing decisions by themselves (case seven:O-118).

Reward improvement

No evidence was found to suggest improvement is rewarded in way similar to Toyota.

Summary

Table D-4: 'Empower employees' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Train on the task-outcome required	N	N	S	S	N	N	N	2/7
Follow the Socratic Method	N	N	N	N	N	N	N	0/7
Train and multi-skill in value-stream tasks	S	S	S	N	S	S	S	6/7
Ensure active mentoring and coaching	N	S	S	S	S	S	N	5/7
Encourage voluntary self-study	N	N	N	N	N	N	N	0/7
Hold employees responsible to surface and solve problems	N	S	S	S	S	S	S	6/7
Reward improvement	N	N	N	N	N	N	N	0/7
Total per case	1/7	3/7	4/7	3/7	3/7	3/7	2/7	--

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.5 Eliminate waste before it occurs

Eliminate waste before it occurs requires that the products or services a organisation provides should be easily producible and assembled, with cross functional team participation through the design and execution process (Bicheno, 2004:27,171; Womack and Jones, 2003:117, 148, 193, 280; Liker 2004:137, 138; Ballé and Ballé, 2005:87). Throughout this process, waste should be

reduced (Ohno, 1988:12, Womack and Jones, 2005) taking the product lifecycle into account (Womack and Jones, 2003:280).

Involve a cross-functional team during the design process

Cross-functional team participation was evident at case one (O-12), case two (P-191), case three (P-192), case four (O-71), case five (P-201), and case seven (I-116).

Take the overall lifecycle into account

No evidence was found to indicate the overall lifecycle is taken into account in trying to eliminate waste before it occurs.

Design products that are easy to produce

Case two applies online psychometric testing (O-40) and standard formats (O-41). One of the participants in the interactive presentation also noted that they balance production ability and product aesthetics (P-193). Case four uses computer aided design to simplify the manufacturing process (O-70) and tweak designs until it suits the manufacturing process (O-74). Case six redesigned their cash receipt payment system for easy use (I-107), simplifying and optimising their administration and control (I-110). One the production side, case six experiments with designs of competitors to see which designs they can easily manufacture (O-88). Case seven simplified their application process for easier use (I-113) and re-designed their pasta recipe to suit their shop layout and organisation format (I-116).

Summary

Table D-5: 'Eliminate waste before it occurs' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Involve a cross-functional team during the design process	S	S	S	S	S	N	S	6/7
Take the overall lifecycle into account	N	N	N	N	N	N	N	0/7
Design products that are easy to produce	N	S	N	S	N	S	S	4/7
Total per case	1/3	2/3	1/3	2/3	1/3	1/3	2/3	--

Legend: S Some evidence found to suggest activity is present
N No evidence found to suggest activity is present

D.1.6 Promote flow

The term *flow* is used to capture the TPS principle of linking operations output to customer demand (Ohno 1988:2, 39, 68, 95, 107, 127; Womack and Jones, 2003:110) and removing all hindrances towards achieving this goal (Womack and Jones, 2003:58, 60, 61, 319, Ballé and Ballé, 2005:182, 266). To this end, Toyota continuously develops a set of tools to facilitate flow (Marwinski and Shook, 2006: 18-19, 26-28, 39-42, 50, 63, 95-96; Liker, 2004:160, Ballé and Ballé, 2005:51), resulting in parts that arrive on time, in the right quantity and appropriate quality (Womack and Jones, 2003:137; Ballé and Ballé, 2005:172). However, care is taken to have supply chain wide optimisation (Ballé and Ballé, 2005:226-228; Bicheno 2004:183).

Link operations output to customer demand

Case one, 2, and 7 aims to match customer demand to launch quantities (O-1, O2, P-219, and P-224). By its very nature case four and 7, as franchise organisations are closely coupled with customer demand. Case five, as a purely service-based organisation, cannot place candidates if it is not required by the customer. Although it was not stated explicitly, case three also seems to be able to link their supply to customer demand, as much as it is able for an exporting organisation to accomplish, due to the lack of idle inventory (O-52). Case six, due to its small size, conducts its organisation more like a job shop, which also results in low inventory and building of its organisation around customer demand, keeping inventory of subassemblies to be able to respond quickly (O-89).

Remove factors impeding flow

Evidence was found of removing impeding factors to flow. All seven cases implements tools similar to what Toyota uses or has developed, or is at least busy with developing their own tools to improve flow of their product or service, e.g., supermarkets (O-3, O-56, O-89, O-90), SMED (I-41; O-54), autonomous maintenance (I-47), TAKT (I-48; I-50; P-213), frequent re-layout (O-57), JIT delivery (P-219), Kanban (P-213), flexible machinery (P-220), inventory reduction (P-214, O-103, P-224), Andon (P-222), flow lines (O-104), single platform multiple products (P-231).

Keep the overall supply chain in mind

With regards to the impact of flow on the overall supply chain there seems to be at least some understanding of the implications of global supply chain optimisation among case one, 2, 5, and 7 (P-225; P-226, P-212, P-217) with a goal to improve this further (P-218, P-229).

Manufacture Just-in-Time

No evidence was found to suggest the selected cases manufactured Just-in-Time

Summary

Table D-6: 'Promote flow' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Link operations output to customer demand	S	S	N	S	S	S	S	6/7
Remove factors impeding flow	S	S	S	S	S	S	S	7/7
Keep the overall supply chain in mind	S	S	N	N	S	N	S	4/7
Manufacture Just-in-Time	N	N	N	N	N	N	N	0/7
Total per case	3/4	3/4	1/4	2/4	3/4	2/4	3/4	--

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.7 Increase resource effectiveness and efficiency

The TPS view of effective resources is that they are value adding or **valuable** from the customer's perspective (Womack and Jones, 2003:10, 19, Liker, 2004:27, 28, Bicheno 2004:10). the TPS strives to improve such resources until they are waste free or **capable**, producing at the highest quality, yield, speed and lowest cost throughout its lifetime, through a programme of scientific maintenance and uses tools such as TAKT time to prioritise improvement to resources (Dennis, 2007:39,40; Bicheno, 2004:36, 56; Marwinski and Shook, 2006:61, 92; Ballé and Ballé, 2005:254). The low waste environment is complemented with an absence of six major losses, downtime, changeover time, minor stops, speed losses, scrap and rework, resulting in resources that are **available**, delivering below TAKT time (Bicheno, 2004:57, 58; Dennis, 2007:40, 41, Marwinski and Shook, 2006:61). These resources are also right sized, or **adequate**, dedicated to specific value-streams (Womack and Jones, 2003:265, 316-317, Liker 2004:92-93). The quest is to be so **flexible** as to provide individual customers tailored products for their unique needs. This is the opposite of mass production (Ohno, 1988: xiv, Liker, 2004:8; Ballé and Ballé 2005:179).

Ensure real value-add is specified – valuable

Only case two exhibited evidence of actively seeking to understand what their customers regards as value adding. They ensure their products are best practice (P-240) and remain effective (P247), by focusing on their client needs (P-233).

Maximise the capability of processes by removing waste – capable

Case one, 3, 5, and 6 exhibited some evidence of ensuring their resources are capable. Case one, 3 and 6 conducts regular kaizen activities (case one: O-10, O-18; case three: I-47, Case six: O-91). Case five employed personnel to focus specifically on the capabilities of their processes (O-15).

Ensure a process or resource is available when required – available

Evidence was found at case one, 3, 4, and 6 that suggests a focus on availability of resources (O-10, I-48, I-47, and I-50, O-53, P-235, P-249, P-242, and O-91). Examples include a preventive maintenance system of case one and 3, as well as conducting maintenance with the help of operators (Case one: O-10,18; Case three: I-47), case four's assertion that there machines are well maintained (P-235, P-249). Case six has standardised a set of activities their operators perform to ensure output remains acceptable (O-91).

Acquire processes and resources of adequate value-stream capacity – adequate

Evidence that supports a focus on the adequacy of resources was found at case two, 3 and 5. Case two uses subcontractors to level their load, potentially comparable to acquiring processes and resources of adequate value stream capacity, but specific to their environment (P-212). Case two also organises their teams by client and installs client managers (case two: I-26). Case three re-employed discarded machinery from their European counterparts, with limited modification, instead of buying new machinery (I-50), resulting in incremental capacity tailored to the specific production line requirements and nothing more. Case five employs new people resources from the standpoint of flow, or the adequacy of the process, as opposed to function, with multi-skilling of their resources (P-250).

Modify processes or resources to do quickly change over from one product to another – flexible

Case one, 2, and 3 showed evidence of a focus to establish flexible processes (O-121; P-240; I-47; O-54). Examples include case one and 3's SMED activities on shop floor resources (O-121, O-54) and case two seems ability to adapt quickly to changes in customer needs (P-240).

Summary

Table D-7: 'Increase resource effectiveness and efficiency' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Ensure processes truly specify customer value	N	S	N	N	N	N	N	1/7
Maximise the capability of processes by removing waste	N	N	S	N	S	S	N	3/7
Ensure a process or resource is available when required	S	N	S	S	N	S	N	4/7
Acquire processes and resources of adequate value-stream capacity	N	S	S	N	S	N	N	3/7
Modify processes or resources to quickly change over from one product to another	S	S	S	N	N	N	N	3/7
Total per case	2/5	3/5	4/5	1/5	2/5	2/5	0/5	--

Legend: S
N

Some evidence found to suggest activity is present
No evidence found to suggest activity is present

D.1.8 Standardise

Standardisation suggests that work is structured according to a standard set of tasks, specifying content, sequence, timing and outcome (Liker, 2004:140-142; Spear and Bowen, 1999:97,98; Ohno, 1988:22); that management actively test whether these standards are in place as part of

their knowledge transfer methods (Spear and Bowen, 1999:99; Liker, 2004:225; Liker and Hoseus, 2008:149-151), and that these standards owned and updated by operators themselves (Liker, 2004:148, Bicheno, 2004:54-55).

Structure to a standard set of tasks

Evidence was found to suggest work standards being applied. Examples include inventory management processes (case one:I-13); SOPs in operations (case one:O-5; case three: I-40, I-44, O-58, O-59; case four: I-65, I-68 – implied; case five: O-78; case six: I-95 – implied; case seven: I-122, Case seven:O-109) standards in billing (case two:I-23, I-35, O-41); equipment operation (case three:I-51); team norms (case five: I-89 – implied), performance measures (case five: P-285, case seven: P-259), sub-assemblies (case six:I-105); accounting systems (case six: I-107, I-110); housekeeping (Case six:O-91), vetting financial applications (case seven: I-113), improving measuring equipment (case seven: I-122, O-102), packaging (case seven: I-128), franchising (O-112), similar ingredients in more than one recipe (case seven: P-231).

Test whether standards are in place

No evidence was found to indicate management actively goes to the *Gemba* to test the implementation of these standards.

Have operators own and update standards

There was evidence that showed employees had access to own and update procedures, e.g., influence inventory controls (case one:I-12; I-13, I-14); implement 4S (case one:I-8, O- 4), influence SOPs (case one:O-6), carte blanche to develop new standards (case two:I-35, O-48); team discussions to improve standard work (case five: O-79; case six: O-94).

Summary

Table D-8: 'Standardise' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Structure to a standard set of tasks	S	S	S	S	S	S	S	7/7
Test whether standards are in place	N	N	N	N	N	N	N	0/7
Have operators own and update standards	S	S	N	N	S	S	N	4/7
Total per case	2/3	2/3	1/3	1/3	2/3	2/3	1/3	--

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.9 Formalise industrial engineering

The '*Formalise industrial engineering*' strategy of Toyota is part of the never ceasing focus on technical and labour efficiency to drive the profitability and sustainability of the organisation (Toyota, 2009a:2, 28; Toyota, 2008a:14; Toyota 2007e:14; Toyota, 2007f; Ohno 1988:18, 62). As opposed to incremental continuous improvement (*Kaizen*) Toyota follows a formal process for radical, stepwise improvement to reduce waste called *Kaikaku* (Bicheno 2004:145; Womack and Jones 2003:23). The outcome of such improvement is the reduction of work content and variation (Ohno, 1988:18; Ballé and Ballé, 2005:118, 133; Bicheno, 2004:55, 141; Womack and Jones, 2003:25). Toyota views these initiatives as sensible only if it results in cost reduction, which Ohno called profit making industrial engineering (Ohno, 1988:18, 71-72,126). A specific focus of improvement is to optimise operations methods and layouts to enhance human performance, (Ohno, 1988:62; Ballé and Ballé, 2005:107,108; Dennis, 2007:62, 63, Marchwinski and Shook, 2006:7, 8; Liker, 2004:98).

Install a process for facilitated, radical improvement

All of the cases had evidence that showed waste reduction takes place. Examples of reduction of the TPS seven wastes include transport (case three:I-45, case six:O-92), inventory (case six:O-89), motion (case three:O-55), waiting (case two:1-23), overproduction (case two: I- 24), over-processing (case three:I-41), and defects (case one:I-11, I-4 case three: I-44, I-46, I-50; case four:1-65; case six:I-101, I-98).

However, only four of the seven cases had evidence at the time of a formal, systematic approach towards to stepwise improvement (case one:I-11, O-17; case three:I-41, P-297; case five:O-77; case seven:O-113). At some cases waste reduction resulted in a reduction in variation (case one:I-4, case six:I-110, I-128, O-109; case seven: P-259) and work content (case three:I-48, I-50, I-54, O-55; case six:I-107).

Let the industrial engineering department be profitable

Some cases have dedicated individuals that fulfil an industrial engineering function (case one:O-18, case three:P-297, case five:O-77). However, no explicit link occurs between the improvement activities and their financial impact as a basis for prioritisation and feedback.

Create methods and layouts that are optimised for human performance

Six of the seven cases portrayed evidence of optimising operations methods and layouts for human operation. Case one installed flow lines (O-32) and organise according to products (O-34). Case two organises their layout to share information, encourage knowledge management and facilitate teamwork (P- 380; P- 387). Case three frequently changes line designs to improve manufacturing (O- 49), and has built a system around organising shop floor resources and equipment (P-381). Case five's senior managers placed their offices in between their teams to promote efficient communication and easy access (O-80); ensures that team members have direct access to the correct equipment to do the job, and places their teams in close proximity to each other to improve communication (P-390; P-397). Case six installed a computer system to streamline their account handling and improve access and communication (I-107, I-110), reorganised their facility to have easy access to tools (O-92). Case seven also organises their offices according to products to facilitate communication and knowledge transfer (O-115), and co-locate these teams as far as possible (O- 116).

Summary

Table D-9: 'Formalise industrial engineering' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Install a process for facilitated, radical improvement	S	S	S	S	S	S	S	7/7
Let the industrial engineering department be profitable	N	N	N	N	N	N	N	0/7
Emphasize methods and layouts that are optimised for human performance	S	S	S	N	S	S	S	6/7
Total per case	2/3	2/3	2/3	1/3	2/3	2/3	2/3	--

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.10 Create intelligent processes

Automation requires a machine to be stopped before damage done to part, machine or operator, or before a defective product can be passed on (Toyota, 2004d; Liker 2004:16,129-132; Ohno 1988:6; Dennis, 2007:95; Toyota, 2008c:9). If a process is stopped, a system will call on a specific person to solve the problem (Spear, 2002:765). In addition, intelligence will be built into the system, preventing future occurrences of the problem, either through root cause problem solving or Poka Yoke devices (Ohno, 1988:6-8,121-122; Bicheno, 2004:137-138; Dennis, 2007:98-104; Liker 2004:128-130).

Stop a process before damage can be done

Some evidence was found to suggest that some of the cases installed systems that stops processes before defects occur. This included financial process triggers (case one: O-9), customer satisfaction triggers (case two: P-254), operations error avoidance (case three: I-53, O-60, P-262) and operations flow triggers (case five: P-222).

Ensure specific accountability to add intelligence to processes

Limited evidence existed to show that the systems call on specific people to solve a defect raised by the system when it occurs. In both cases it meant subordinates raising a problem to a manager's attention (case four: O-73; case six: O-94), and receiving an immediate response.

Implement devices to prevent future occurrences of the problem

There was evidence to suggest that once defects occur, steps are taken to prevent it from happening again. Examples include displaying what 'correct' looks like (case one: I-4, I-5, O-8), using team accountability to prevent errors (case two: O-43), hardwiring process mechanics for permanent solutions (case three: I-53, O-60), pasting proof of an outcome to a product, e.g., payment to a product to approve delivery (case six: I-107) and using audiovisual management to suggest an outcome, e.g., timers in a food manufacturing process (case seven: O-109).

Summary

Table D-10: 'Create intelligent processes' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Stop a machine before damage can be done to part, machine or operator	S	S	S	N	S	N	N	4/7
Ensure specific accountability to add intelligence to processes	N	N	N	S	N	S	N	2/7
Implement devices to prevent future occurrences of the problem	S	S	S	N	N	S	S	5/7
Total per case	2/3	2/3	2/3	1/3	1/3	2/3	1/3	--

Legend: S
N

Some evidence found to suggest activity is present
No evidence found to suggest activity is present

D.1.11 Balance resources

To balance resources, Toyota fits customer demand into a level schedule, i.e., level demand and actively balancing operator work (Liker, 2004:115, Marchwinski and Shook, 2006:28). They do this through using standard work and TAKT time (Ballé and Ballé, 2005:79, 118, 133, Bicheno, 2004:55,141, Liker, 2004:147, 148), separating rework from normal production (Ballé and Ballé, 2005:217; Ohno, 1988:41), and finding equilibrium between make to order and make to stock (Liker, 2004:121, 122).

Fit customer demand into a level schedule

Some alternative ways of balancing exist – case four uses the number of diamonds to set in a ring as an indicator of the amount of work an operator can do and a way to balance their manufacturing (case four: O-72, P-193). Case seven uses a history of output as an indication of what may be achieved in the future (case seven: P-378).

Case two had assembled all their managers and reassigned roles and responsibilities to improve resource balancing (case two:1-25, 1-26). The majority of the cases used an informal way of scheduling that may have been possible because of the small size of the organisation. Case two asks team members if they have capacity and schedules accordingly (case two:O-45). Case five employees mostly sit in one area and balance resources through setting targets that are visible to all, apparently resulting in more balanced work (case five:I-77). Case six apparently achieves balance through informal task assignment, possible because of their small size (case six:O-93). A case seven franchisee allows and expects their kitchen staff to balance themselves, which they seemingly manage to do in an informal way (case seven:O-108).

Use standard work to balance resources

The evidence that support the use of standard work include the use of SOPs or process planning sheets (case one: O-25, O-27; case three:I-52, O-58, O-59), manpower calculation and assignment (case one:O-26), using equipment running at a standard pace to enforce standard timing (case three:I-51), and improving work elements to be able to free up resources (case three:O-61). A limited example was found at case two, i.e. SOPs or operations standards in billing (case two:I-23, I-35, O-41). However, this was not linked to work elements below 1 minute.

Separate rework from normal production

No evidence was found to suggest the cases actively tried to separate rework from normal production.

Find equilibrium between make to order and make to stock

Case one, case three, and case six uses supermarkets to try and obtain a balance between make to order and make to stock (case one:O-2, O-3; case three:O-56, case six:O-90).

Summary

Table D-11: 'Balance resources' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Fit customer demand into a level schedule	N	S	N	S	S	S	S	5/7
Use standard work to balance resources	S	S	S	N	N	N	N	3/7
Separate rework from normal production	N	N	N	N	N	N	N	0/7
Find equilibrium between make to order and make to stock	S	N	S	N	N	S	N	3/7
Total per case	2/4	2/4	2/4	1/4	1/4	2/4	1/4	--

Legend: S Some evidence found to suggest activity is present
 N No evidence found to suggest activity is present

D.1.12 Enable visual management

Toyota uses visual management as part of their strategy to have efficient closed loop communication and make problems visible (Liker, 2004:158). Toyota enables this through a method and discipline called the 4 S'. This method consists of Separate – sort, Set in order – set in order, Set countermeasures – shine and set countermeasures, Standardise and sustain – standardise and sustain. Practicing these disciplines enables a visually self-explaining, self-

ordering, and self-improving workplace (Ballé and Ballé, 2005: 121; Liker 2004:36, 150- 152, Dennis, 2007:31; Bicheno 2004:53)ⁱ.

Limited evidence was found for 'Separate' and 'Set countermeasures', with more evidence supporting 'Set in order'. No evidence was found supporting 'Standardise and sustain'.

Separate

Evidence supporting Separate or sorting include case one's 4S action lists that indicate sorting activity (case one:O-36), case two implementing a new project budgeting mechanism to ensure they kept and focus on the correct information (case two:I-24), and case three's drive to keep things simple and visual (case three:P-423).

Set in order

Evidence supporting Set in order or 'set-in-order', include improved means of communication (case one:I-18), visual key performance indicators (case one: O-35; case five:P-285, P-96), visually indicating when a problem occurs (case one:O-37), action lists in visible areas (case one:O-36; case three: O-68, P-423), visible and standardised reports (case two:I-24), posted value-stream maps (case three:O-50), use of electronic boards on the shop floor or in other areas (case three:O-66; case seven:O-110, O-111), posting the organisation vision and mission throughout shop floor and office areas (case three:O-67), using colour control and lights (case three:P-430, case four:P-431), attaching order information to products (case six: O-101) and sending SMS' to clients to inform of delivery times (case seven:I-125).

Set countermeasures

An example of Set countermeasures is the proactive nature of case two consultants to alert directors of challenges that they face (case two:P-436), improved accountability (case two:I-24), and action being taken to address problems raised visually (case one: O-36, case three: O-68). A possible alternative to visual communication include verbal communication, e.g., case two's assertion that they verbally make aware and address problems effectively (case two:P-429, P-422).

Standardise and sustain

No evidence was found supporting Standardise and sustain.

ⁱ It is important to realise that the language used here denotes a rich set of activities and should not be taken at face value only. For more info refer to the literature study.

Summary

Table D-12: 'Enable visual management' Matrix

Main activity	Case one	Case two	Case three	Case four	Case five	Case six	Case seven	Total
Separate	S	S	S	N	N	N	N	3/7
Set in order	S	S	S	S	S	S	S	7/7
Set countermeasures	S	S	S	N	N	N	N	3/7
Standardise and sustain	N	N	N	N	N	N	N	0/7
Total per case	3/4	3/4	3/4	1/4	1/4	1/4	1/4	--

Legend: S
N

Some evidence found to suggest activity is present
No evidence found to suggest activity is present

E. Toyota's Global Vision 2020

Company Outline

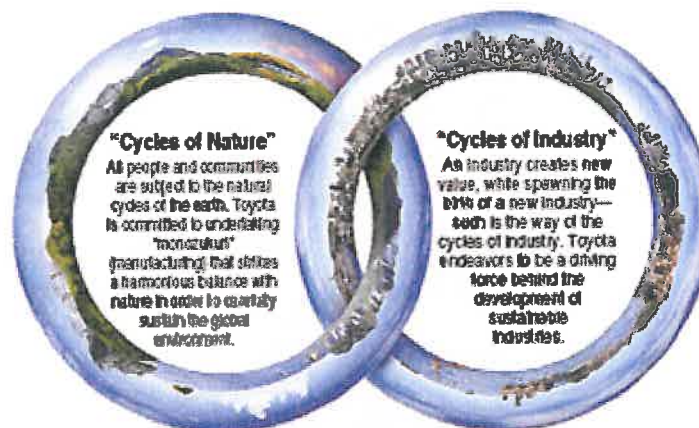
Toyota Global Vision 2020

The environment surrounding the automotive industry is undergoing drastic changes, with economic development accelerating in a number of regions throughout the world and environmental and energy-related issues having an impact on a global scale. Amid these changes Toyota endeavors to remain a useful member of the global and local communities and toward this end has formulated its "Global Vision 2020", which provides a vision for Toyota's place in the world 10 to 20 years in the future.

Open the Frontiers of Tomorrow through the energy of people and technology

The slogan "Open the Frontiers of Tomorrow" is an expression of the desire by Toyota and each of its employees to help create a path to a new world and to work steadily toward the realization of society's dreams. And this progress is to be achieved "through the energy of people and technology".

"Monozukuri" and the Cycle of Nature ... Toyota's World View and Our Mission



Toyota's mission as it heads toward the year 2020 is to reexamine the relationship between nature and industry and to help promote efforts toward finding a harmonious balance between the cycles of nature and the cycles of industry.

Now is the time to return to the spirit of our foundation

For Toyota to carry out its mission to help build the world of tomorrow and create a place for itself in this future, a number of hurdles and major challenges comparable to those Toyota faced at its founding must be overcome. Toyota's history is one of individual challenges. The invention of the automatic loom. Automobile manufacturing—a field once unknown to Japan. And the commercialization of hybrid vehicles. This repeated process of overcoming challenges has strengthened Toyota's manufacturing and enabled it to produce new value ahead of the times. Now Toyota is embarking on new challenges that will strengthen and develop the company as it moves toward the year 2020.

Challenge takes Toyota higher

Toyota: In pursuit of higher ideas

Since its founding, Toyota has endeavored to seek out challenges, to always value each individual customer, to maintain consistently high quality and to give tangible shape to its ideas. These sound practices have been passed down and improved over the years, evolving into the three "pursuits" that are Toyota's strengths.

More advanced: In endless pursuit of technology and technical skills
Toyota seeks to find a harmonious balance between nature and industry; to continually develop a broad range of innovations in technology and skill; and to ask itself what is best for people and the world.

More dedicated: In pursuit of our human resource development and reinforcement of teamwork
Toyota endeavors to create greater opportunities for its employees to put their skills and abilities to use; to develop those skills and abilities to their highest potential; and to foster organizational strength that both produces and interlinks expertise.

More inquiring: In pursuit of new markets and new value creation
Toyota constantly focuses its attention throughout the world on pursuing new value and quality in terms of its products. It strives to achieve practical application of its new technologies and ideas to provide optimized products for each region and offer Toyota value to society overall.

Figure E-1: example of Toyota's Global Vision 2020 (Toyota, 2008c:4)

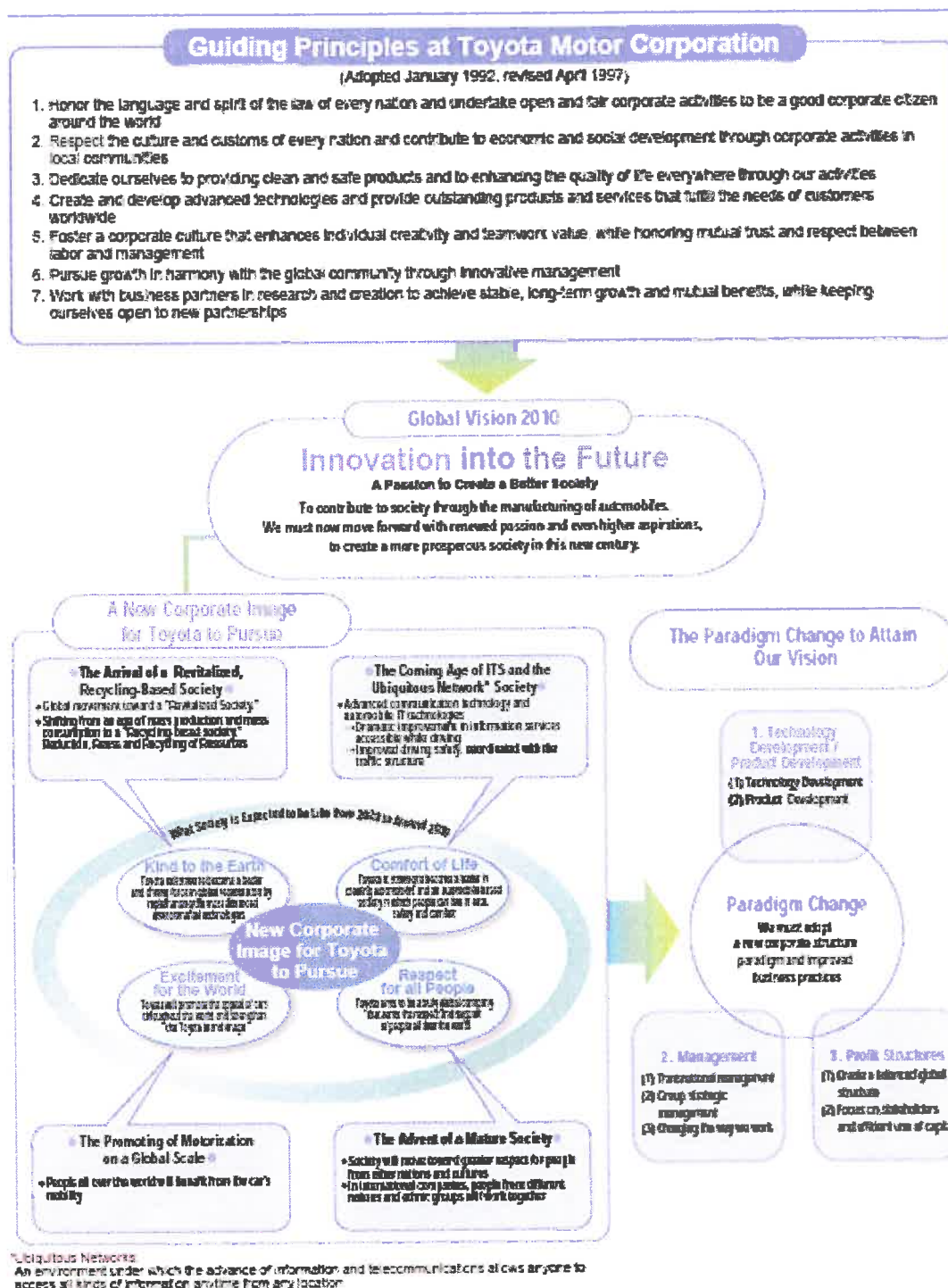


Figure E-2: Example of Toyota's Global Vision 2010 (Toyota, 2003a:5)

F. Microsoft Access Database view: Capture sheet

The screenshot displays the Microsoft Access application window titled "Combined Form - Microsoft Access". The ribbon at the top includes tabs for "Home", "Create", "External Data", and "Database Tools". The "Database Tools" tab is active, showing options like "Table", "Table Templates", "Table Design", "Form", "Split Form", "Multiple Items", "More Forms", "Form Design", "Report", "Blank Report", "Report Wizard", "Report Design", "Query Wizard", "Query Design", and "Macro".

On the left, a "Navigation Pane" is visible. The main area shows three forms stacked vertically:

- Presentation_Evidence**: Contains fields for "Pres_No" (1), "Case_No" (1), "Evidence_Desc" ("Aerosud people to change their view from personal success only to company success"), "Toyota_Attribute on Form" (Design for Operations), and "PresEv_Atr" (Evidence: Attribute_Name). It shows 1 of 1 records.
- Operations_Evidence**: Contains fields for "Ops_Evid_No" (1), "Case_No" (1), "Evidence_Desc" ("Case 1 links customer demand to launch quantities, for example their Boeing and Labinal (Airbus) product lines"), and "OpsAnEv_Atr" (Evidence: Attribute_Name). It shows 1 of 1 records.
- Interview_Evidence**: Contains fields for "Int_Evid_No" (127), "Int_Level" (3), "Case_No" (7), "Evidence_Desc" ("Toyota Learning III. Noriè: Why are these aspects important? Respondent 7C: I want my shop to be the best pizza place - I want to be better than the other franchises. I want to be acknowledged as the best franchise the country."), "Int_Name" (7C), and "IntEv_Atr" (Evidence: Attribute_Name). It shows 2 of 2 records.

At the bottom, a "Form View" status bar is visible.

Figure F-1: Microsoft Access Database capture sheet

G. Extract from research database: Strategies

Extracts of pieces of evidence sorted by case number and by strategies they inform. However, a unique piece of evidence may inform more than one strategy. When evidence is quoted, a 'P-', 'I-' or 'O-' with a number following will be seen. 'P-' represents evidence from the interactive presentation feedback, 'I-' represents evidence from the interviews and 'O-' represents evidence from the structured observations. The number following each dash represents the unique number for that piece of evidence as used in the database.

G.1 Increase customer value

Case 1

I-10 TOYOTA Learning III

Nortjé: Why are these aspects important?

Respondent 1B: It Boils down to customer focus and customer need. What do they want and what are they willing to pay for? The customers want to see cost decreasing as ongoing. If not, you will be forced out of the industry. It provides the customer satisfaction. It helps with marketing yourself and the company out there. Also, as part of the Global economy we have to get lean. Not only in cost but also in customer satisfaction. We have to improve our low return and fully satisfy the customer. We have to become a healthy company internally. We have to combine the factors that can turn this into a healthy company.

I-13 TOYOTA Learning III

Nortjé: Why are these aspects important?

Respondent B: I believe we can create a learning culture inside the company if we ask the right questions. It is the better alternative and more cost effective, it makes things and we will be more customer focused. We can create an environment in which people are evolving to better standards. We need to be able to compete in our market and stay flexible and not get stuck in our ways. Learning is important. We can also get rid of waste. You do not want waste in your processes, because it is multiplied every time you do it. Processes are slower and less cost effective. We need to be as lean as possible and we have to comply with the regulatory authorities to maintain

contracts. Our industry is regulated because of safety requirements and we could forfeit our contract with our customers. We made this new procedure available to the whole company, everyone is working to a higher level, so now if we come across any challenges we will work from that level, and so keep on improving.

I-16 TOYOTA Learning III

Nortjé: Why are these aspects important?

Respondent 1C: We can use people in other projects and get the stuff out of the door quicker.

Nortjé: Why is this important?

Respondent 1C: Because of customer satisfaction. If packaging material is not delivered on time it leads to other issues. We employed another packer for two of the products as we could not get all of the goods out in time. Appointing the packer helped us progress to getting the goods out of the door on time.

Nortjé Why is this important?

Respondent 1C: The quicker the goods get out the door the happier the system.

Nortjé: Any other reason?

P-36 "Increased customer satisfaction through reduced defects and reduced lead

P-64 "Internal customers not important to us, only delivery to the outside customers. Need to focus on customer satisfaction"

P-71 "Most of the people do not understand what, why etc the customer wants. People need to understand their role / importance in our 'food chain'"

Case 2

I-21 TOYOTA Learning II

Nortjé: Why was it important to solve this problem?

Respondent 2A: Have you read The Goal? It is about flow and productivity - we did not have balanced flow of work. We would get four projects at a time - and it becomes a traffic jam. It is about capacity management - we do not

want resources that do not have work but also not those who work significant overtime, that the client is not willing to pay for. It comes down to optimal

I-25 TOYOTA Learning III

Nortjé: Why are these aspects important?

Respondent 2A: Because of financial soundness and the ability to viably scope projects. It will help that we offer market related and realistic offers to our customers. It improves morale and resource utilisation, but it needs to be managed.

I-26 Toyota Learning I

Nortjé: Can you give an example of a problem that you have recently successfully solved (i.e. results are improved as expected and problem is not recurring anymore)

Respondent 2B: We had a problem with the availability of Directors, and they said they needed to avail themselves more to the business. They had to make some structural changes to be less operationally involved. They got the entire company together, not the operational side - only consulting, and we discussed plans on how to structure the teams, so that they could release the Directors. We brainstormed plans, analysed each others' personalities, discussed our clients and listed the projects, to see where they were too involved to see where we could release them. We noted everyone's preference to find those comfortable with managing and those who preferred specialisation, either in organisational development or in human resources. Some were in the middle of the road. Eventually we designed a new structure, and established client managers for the bigger clients, with smaller teams reporting to them. The Directors were able to get more involved in managing the business, and are more available than they were in the past. We now need to get the client managers to the level of the Directors. We have found a new predicament - in the managing of our resources. Where do you draw the line between increasing capacity and getting more work in?

O-42 Case 2 recently held a strategic planning session where they revised a strategy to work with clients. A big group of the organization participated. They decided to mine existing clients, as they do not use all of the retainers negotiated with existing clients.

- P-121 "We put our work (clients) before our needs"
- P-16 "What we need to improve at - becoming a more diverse organisation. What we are good at - customer focus, delivery focus / timely, sharing of info"
- P-170 "We should get closer to the clients' problems (more involved). Managers at CT are very involved, hands on, informed on all clients' projects."
- P-226 "We can improve by being more in touch with customer need, predicting their need, so we can be more prepared. Know which mode we are in - performance management, competency profiling, etc."
- P-233 "We sometimes battle with total effectiveness. We over/underestimate our clients' needs and priorities"
- P-261 "Very little or no measures in place to stop the process before delivering results to clients. Judgment of consultant is the only measure in and that is reliant on his understanding of the client's needs. No knowledge management"
- P-44 "We are very focussed on relationships with clients and co-workers, but not really society / country, etc. Focussed more on short term?"
- P-51 "We want to leave a legacy - it is not about individuals or what they get out of it. It is about what our clients get and how we help better the lives of those less fortunate. We are in the relationship business"
- P-65 "We are very focused on personal relationships / understanding the client / delivering a service to a client's satisfaction. We are dependent on their"
- P-72 "We do a lot to understand our customers. We offer 'intangibles' which can only be valuable to the customer if he has the need at the time. We live close to our customers - the client managers have an important role"
- P-79 "We are very customer focused in our delivery. Going forward we can improve by getting to understand the diverse customers in diverse markets and come up with solutions and thus giving us the competitive edge"
- P-86 "We constantly change teams to adopt to clients/ projects. We have teams small enough so that everyone can participate. Small teams (5 or 6) with client manager / project administrator"
- P-9 "We create opportunities - we empower others, if they succeed so do we, we consider satisfaction to be success"

Case 3

- P-66 "Value defined by the customer - too often think what Can I push on the customer while he may actually have very different ideas"

P-80 "Understand internal customers' needs. We often forget about them"

Case 4

I-56 Toyota Learning I

Nortjé: Can you give an example of a problem that you have recently successfully solved (i.e. results are improved as expected and problem is not recurring anymore)

Respondent 4A: At one stage we started getting more customer complaints, and we put a person in charge to deal specifically with customer complaints. In doing so we were able to deal with the needs of 70% of the people.

Nortjé: How do you know the problem was successfully solved?

Respondent 4A: A report we review at our management meeting showed us that the problem had been solved.

I-57 TOYOTA Learning II

Nortjé: Why was it important to solve this problem?

Respondent 4A: We had to see whether there were any real problems. Sometimes problem is taken out of context, and we had to see whether these issues were significant. One customer lost is a huge problem for this business. We also have to keep an eye on the franchisees. If they treat the customer incorrectly we have to educate them.

I-73 Toyota Learning III

Nortjé: Why are these aspects important?

Respondent 4C: We cannot afford to have bad debt and we cannot afford to close a shop down. It affects our income and the brand visibility and customer value if a shop closes down. The more exposure your brand has the better. Therefore it is not good to suddenly loose brand exposure.

Nortjé: Why is this important?

Respondent 4C: We have a brand to grow and business income to grow - this has to increase, not decrease - this is the goal.

- P-123 "We can improve at being servants and coaching / teaching. We do promote integrity and the customers' interest as first"
- P-179 "Understand the needs of the customers by talking to them and not deciding it ourselves in a boardroom"
- P-4 "To be the largest Jewellery chain in South Africa. Happy Franchisees equals success."
- P-74 "Focus on customer research & assessing their needs, quality of product and program for measuring nature of customer complaints"

Case 5

I-86 TOYOTA Learning I

Nortjé: Can you give me another example of a problem that was successfully solved?

Respondent 5B: Another example is when a candidate first accepts but then changes his mind and does not start with our client, or dies before he can start or as in one example died within the first three weeks of employment while on company business. In such examples for the sake of goodwill we do not charge the client. We take it as our expense. We work closely with our clients, and want to be on their preferred supplier list. Therefore we would not charge them R150 000 for a guy who was there for two weeks only. Although we are BEE, it makes a big difference if you could be on the preferred supplier list.

I-88 TOYOTA Learning III

Nortjé: Why are these aspects important?

Respondent B: There are a thousand recruitment agencies out there. So we did it to build relationships, capture more exclusive business and improve the trust relationship - that they would trust our judgment.

Take one client for example, a big private investment bank. They have five or six people that we worked with but we built a relationship with two through placing people. When it came to their supplier review we were placed on the preferred supplier list. Traditionally they only deal with big agencies - but because of my interaction with them we are now a preferred supplier.

Nortjé: Why was this important to you?

Respondent 5B: We want to have a close relationship with our suppliers. We want to prove ourselves through our results - finding the most difficult candidates and afterwards getting feedback that our placements are fantastic.

Nortjé: Why is this important?

To gain credibility in investment banking. The client is a phenomenal client and the best locally. When you function in a niche area like we do, our candidates want to go to the best. If you do not have access to the best they will not come to you. Our clients employ the best people and this is the

P-173 "Cannot understand the customer if you do not engage the customer. We need to make effort to fully understand each candidate. We need systems to expose problems"

P-229 "Does the business flow? Volumes of CV's are huge, workloads huge. Need to streamline the amount of paperwork and need to be more efficient in selecting customers. Get more information from customers to ensure we are on the same page with what they need.

P-250 "To employ enough people to ensure the product line flows. CV's to be referenced, typed, double checked, interviewed, in the quickest amount of time. Have enough people to ensure the process flows to ensure clients get a variety of candidates to meet with - in the quickest amount of time."

P-82 "Service to the customer. Early understanding of the client, culture, needs, to find the right people, relationship with clients. Build trust with client who relies on us to find key talent"

Case 6

I-100 Toyota Learning III

Nortjé: Why are these aspects important?

Respondent 6A: I find it a challenge to come up with new products, especially products where I do not need to buy heavy equipment and can solve the problem in a unique way. I sometimes subcontract some aspects of a new product to outside suppliers in order to make it a little bit easier for us to manufacture. One of our competitors recently went bankrupt and we

were asked by one of their customers to produce a similar product to what they had ordered from them: frameless metal doors, and we were able to successfully subcontract the metal forming. One of our other challenges we will have to overcome is the development of a good sales system, be it on the web or when people call in or visit us.

I-102 Toyota Learning II

Nortjé: Why was it important to solve this problem?

Because the quality of the doors were suspect and you could pick it up easily from the outside. You need to have personal satisfaction in your work, and you also need to make the customers happy. My position in the company has recently changed to working with accounts, but still people phone me eight years after I originally sold a door them. Word of mouth referrals and recurring customers are very important.

I-111 Toyota Learning II

Nortjé: Why is this important to you?

Respondent 6C: The handling of paperwork and accounts is important. When we were still located in our old office area some information used to get lost. We had a loose way of controlling and no system in place. This was not beneficial to the company, unorganised and incorrect. Neither the accounting clerks or management knew what was going on. Now, if a client phones in or complains it can be handled immediately. I am quite happy, it is working much better.

P-41 "We must work so that we have less waste at the end of the day so that we
and the client can pay less for the product"

P-69 "Old customers come back to us irrespective of price. Our customers appreciate our personal attention .We render a service to the whole family"

P-76 "Customers must be happy. Sell the customer what they want. Value must be defined by the customer"

P-83 "For us to go forward we need to make sure that the customer is happy and satisfied with our product at all times"

Case 7

I-117 Toyota Learning II

Nortjé: What was the context of solving this problem, that made it important