To determine the key success factors for paperware packaging machinery industry by using AHP-based approach

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Abstract: In this research, analytic hierarchy process (AHP)-based approach was used to determine the key success factors from the management hierarchy on production, marketing, human resources, research and development, and finance. Sixteen key success factors selected on the basis of previous literature were analysed by interviewing paperware packaging machinery manufacturers and experts. We find brand marketing, the establishment of the administration teams, standardised production, procedure management, factory-aimed designed production mix and localised sales service system, inventory management, and accounts receivable to be the six key success factors that are central to Taiwan paperware machinery industry. We hope this finding can assist paperware packaging machinery industry practitioners in Taiwan and other highly service-oriented production industries to achieve business success.

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1 Introduction

A research by Freedonia Group (2013) forecasted that the global demand for packaging machinery is set to be worth $41.8 billion by 2017. A report issued by Small and Medium Enterprise Administration, Ministry of Economic Affairs of Taiwan (2001) indicate that there are more than 100 enterprises in paperware packaging machinery industry (PPMI) in Taiwan. Since having a have capital below $1.7 million, and employees less than 50, most of these PPMIs are categorised as small or medium enterprises (SME) in Taiwan. PPMI in Taiwan once used to completely import advanced paperware packaging machinery from abroad, but gradually, especially in recent ten years, they have begun to build higher efficiency and flexible management in terms of techniques, quality, and production capacity. A report published by PMMI in 1999 have suggested that future trends of development PPMI will be based on the key factors such as speed/automation, incorporation/globalisation, and integration of systems. In Taiwan, the functions and automation of packaging machinery are fairly outstanding, particularly globalisation and integration have achieved remarkable effects on manufacturing of packaging machinery. However, packaging machinery manufacturers in Taiwan have been facing threat from countries in European, the USA and China (MMH Staff, 2013). Because the scale the packaging machinery industry in Taiwan is mostly SME, these enterprises are unable to catch up with the networking information systems of large enterprises in European and US countries. Moreover, the China's development in manufacturing possesses, large-scale enterprises, low capitals, and capability of imitating machinery techniques are creating competitive challenges to Taiwanese PPMI's.

The inevitable trend of internationalisation inspires this research to identify key success factors (KSF) of PPMI using analytical hierarchy process as a decision making tool. In order to internationalise Taiwanese PPMIs', the industry needs to expand abroad and the distribution, assessment of its finance and investment should be thoroughly considered when foreign investments are made. Therefore, the goal of this research is to identify KSF of the Taiwanese PPMIs' to improve their production and services and maximise the profit by foreign investments. Moreover, analytical hierarchy process-based approach to identify KSF will add theoretical value for the researchers in this field.

2   Literature review

2.1   Key success factor

This research focuses on determining the KSF of PPMI. The issue of KSF was first proposed in 1961 by Daniel. He explained the importance of KSF from the viewpoint of the management information system. KSF can be defined as a "qualification or resource that a company can invest in, which in turn, accounts for a significant part of the observable differences in perceived value and/or relative costs in the companies' relevant markets" (Grunert and Ellegard 1992; Amberg et. al., 2005). KSFs are the successful factors which are found based on the characteristics of specific industry and the conditions of the enterprise. Originally, the concept was introduced in the field of management information systems which was later transferred to the field of business strategy research. In the previous literature KSFs was used to identify business characteristic, market description and as a planning tool (Grunert and Ellegard 1992; Benedetto, 1999; Clarke, 1999; Marais et al., 2017). In recent studies KSFs are used for identifying international market development (Lin and Chang, 2017), reliability of smart and connected health software solution (Carroll, 2016), managing city logistics (Kiba-Janiak, 2016), assessment of public food service establishments (Kuznetsova et al., 2016), marketing of cosmetics based on knowledge, attitude and practice (Mohammadzadeh et al., 2017), etc.

2.2   Analytic hierarchy process-based approach

The analytic hierarchy process (AHP), introduced by Saaty (1980) is widely being used as decision making tool in the area of planning, resource allocation, resolving conflict and optimisation (Vaidya and Kumar, 2006; Vargas, 1990). The AHP, accepts interval judgments rather than precise ratios and practically used to solve decision-making problems in uncertain environment (Ahn, 2017; Deng, 2017). Basically in AHP set of evaluation criteria and a set of alternative options are considered among which the best decision are made (Prakash et al., 2018). Some key steps in AHP-based approach include:

1   establish hierarchy framework

2   establish pairwise comparison matrixes

3   calculate eigenvectors and eigenvalues

4   examine the consistency of the paired comparison matrixes

5   calculate the entire weight of the hierarchy (Vaidya and Kumar, 2006; Saaty 1980; Triantaphyllou and Mann, 1995).

The feature of such calculation lies in whether the degrees of influence of factors in layer X + 1 on first hierarchy are affected by factors in layer X. Therefore, three methods are derived as shown in Table 1.

Table 1   Assumption of the global weight: complete inherence, partial inherence, and complete independence

Calculation methods of the global weight	Assumption
Total inherence	The global weights of the selecting factors in layer X + 1 are totally affected by selecting criteria in layer X.
Partial inherence	The global weights of the selecting factors in layer X + 1 are partially affected by selecting criteria in layer X.
Complete independence	Only the selecting factors in layer X + 1 are taken into consideration.

Source: Sheu (2004)

3   Methodology

In this study Sheu's (2004) AHP-based approach is applied to find out all the factors that will affect PPMI and to further calculate the weight of respective factors. In addition, the Ordinal Scale is adopted in filling out the questionnaires: {S0, S1, S2, SL} and pairwise comparison matrixes are then established. By means of subjects' responses and linguistic variables, the order of the selecting criteria is decided. Afterwards, the final weight of each factor is calculated by:

1   partial inherence

2   total inherence

3   complete independence.

Elimination method is then used to exclude the factors that have distinguishably divergent order. Finally, one of the methods above is chosen to extract KSFs according to the industry's situations. KSFs play an influential role in the competition of the industry, and they are also the main determinants of enterprises 'predominance. In the following section, dimensional factors are demonstrated. Both width and depth of the dimensional factors are concerned: the width of the dimensional factors includes enterprise value chain and the five management dimensional factors, while the depth of the dimensional factors contains function policy. Sixteen key factors extracted from the five management dimensions and literary reviews of the factors are demonstrated in Table 2 along with the definition and the explanation of each factor.

Table 2   Definition of factors in paperware packaging industry

Layer 1	Layer 2	Layer 3		Definition of Layer 3	Reference
Key successful factors in paperware packaging industry	A Production	A-1	Supply chain system of central satellite	Suppliers that provide high-quality and inexpensive products and parts processing based in places of production.	Miller and Dess (1996)
		A-2	Standardised production procedure management	Management such as order scheduling, materials purchases and in-process quality cycle costs control.	Miller and Dess (1996)
		A-3	Customised design production plan	Production plans based on customer needs according to raw materials, regions, weathers, etc.	Miller and Dess (1996)
	B Marketing	B-1	Factory-aimed designed production mix	Supply of professional products combination and construction planning, which satisfies customers' need of one-stop shopping.	Miller and Dess (1996)
		B-2	Brand marketing based on customers' praises	Brand marketing that creates benefits and praises after customers' use.	Miller and Dess (1996), Lo (2008), Schmitt (2003)
		B-3	Localised marketing service system	Wide establishment of footholds that do marketing and provide services and training agents for repair service.	Miller and Dess (1996)
		B-4	Complementary marketing based on strategic alliances	Marketing strategy that complements producing high-level European and US products and low-level Chinese products.	Miller and Dess (1996), Hong (2009), Vapola (2010)
	C Human resources	C-1	Establishment of the administration teams	Characteristics training for executives and team organisation training for grass-roots cadres.	Miller and Dess (1996), Alper et al. (2000)
		C-2	Reasonable promotion systems and career planning	Career planning such as promotion through evaluation of administrative performance and professional training.	Miller and Dess (1996), Allen (1997)
		C-3	Fine salaries, welfares, and incentive payment systems	Transparency of salary system, encouragement of in-service education, and reference of technology industry's profit-sharing plans.	Miller and Dess (1996), Papaa and Specialeb (2010)
	D Research and development	D-1	Products development by cooperation between industries and academics	Cooperation of new products development with research centres or innovation incubator centre in universities.	Miller and Dess (1996), Peters and Etzkowitz (2009)
		D-2	Achievement of mechatronical integration by applying IT techniques	Enhancement of the precision and validity of products by applying Taiwanese automatic control system and information service system.	Miller and Dess (1996), Lin (2010), Lohbeck (2008)
		D-3	Combination of European and American key techniques by establishing strategic alliances	Cooperation with European and US enterprises to achieve complementary effect on production and marketing, thereby obtaining technology transfer rights.	Miller and Dess (1996), Liao (2010), Tsai (2009)
	E Financial affairs	E-1	Management of inventory and accounts receivable	Enforcement of inventory control system and control of accounts receivable ratio.	Miller and Dess (1996), Capkun et al. (2009)
		E-2	Capital turnover and costs control	The ratio of cash flow, production cycle, material costs, and operation expenses.	Miller and Dess (1996), Weustink et al. (2009)
		E-3	Financial leverage of the development of investment	Investment references to debt-to-equity ratio and non-current asset turnover.	Miller and Dess (1996), Ndikumana (2005)

3.1 Questionnaire design

According to Table 2, there are four parts in the content of the questionnaire:

1 Personal data.

2 Five dimensions in dimensional Layer 2. In the second part, the impacts on the PPMI are concerned, and the dimensions are ranked from 5 (highest impact) to 1 (lowest impact).

3 The impact of factors in Layer 3 on the PPMI. The factor that possesses the most impact is ranked 3, and the factor that possesses the least impact is ranked 1.

4 There are 16 factors in Layer 3, and the factor that has the most impact on the paperware packaging industry is ranked 16 and the ranking decreases as the impact of the factors drops.

The pretest of the questionnaire design in this research was conducted by interviewing experts to make the questionnaire design accurate. Ten interviewees, including entrepreneurs, chief executives, and experts from the PPMI were invited to do the pretest: they were asked to screen the collected questionnaire items and to comment on the frame, the content, and the diction of the questionnaire.

The interviewees of this research were aimed at department chief executives and above. Therefore, the questionnaires, which were 40 in total, were distributed to them, and the distribution of the questionnaires was between October 20th, 2010 and November 20th, 2010.

4 Analysis and results

4.1 Samples and analysis of descriptive statistics

Forty questionnaires were distributed and 35 of them were collected, in which the response rate was 88%. In 35 samples, 82.9% are male, and 17.1% are female. As for the interviewees' education level, senior high and advanced technological college accounted for 34.3%, vocational school 31.4%, and university and above (which included master degree) 34.3%. As far as their ages are concerned, those who are between 40 and 49 accounted for 35.7%, and those who are between 50 and 59 made up 31.0% of the interviewees. Their salaries are range between \$2,000–\$3,000, which accounted for 31.4%, and \$3,001–\$5,000 and above, which accounted for 31.5%. As for the interviewees' years of service, most of them had worked in their industry for more than ten years, which accounted for 62.9%. Moreover, 11 of them work in production department, eight of them work in marketing department, five of them work in R&D department, six of them work in human resources department, and five of them work in financial department.

4.2   Weight of the dimensions and calculation of the weights of the factors

4.2.1   Establish pairwise comparison matrixes

The questionnaire is designed on the hierarchy framework. To find out the importance degree among each hierarchy, the hierarchies are pairwisely compared to establish pairwise comparison matrixes, as shown in Table 3. The ordinal values in horizontal rows serve as the denominators, and the ordinal values in vertical columns are numerators. The denominators and the numerators are then laid in the matrixes to obtain the pairwise comparison matrixes in dimensional Layer 2, as shown in Table 3. The successive matrixes are obtained by the same way. What is particularly worth mentioning is that the importance of a matrix is larger when its order is bigger, its score is higher, and its weight is larger.

Table 3   Pairwise comparison matrixes in assessment dimensional Layer 2

Order		3	5	2	4	1
	Assessment dimensional Layer 2	*A*	*B*	*C*	*D*	*E*
3	A	1	3/5	1 1/2	3/4	3
5	B	1 2/3	1	2 1/2	1 1/4	5
2	C	2/3	2/5	1	1/2	2
4	D	1 1/3	4/5	2	1	4
1	E	1/3	1/5	1/2	1/4	1

4.2.2   Calculate eigenvectors (W'_i)

The method to analyse eigenvectors (W'_i) is:

$$\begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{21} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & 1 \end{bmatrix} * \begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ W_N \end{bmatrix} = \begin{bmatrix} W'_1 \\ W'_2 \\ \vdots \\ W_N \end{bmatrix}$$

With the content in Table 3, eigenvectors (W'_i) can be obtained, and the influential order is shown in Table 4.

Table 4   Weights of the assessment dimensional Layer 2

Assessment dimensional Layer 2	A	B	C	D	E	W_i	W'_i	Order
A	1.00	0.60	1.50	0.75	3.00	1.152*	0.200**	3
B	1.67	1.00	2.50	1.25	5.00	1.919	0.333	5
C	0.67	0.40	1.00	0.50	2.00	0.768	0.133	2
D	1.33	0.80	2.00	1.00	4.00	1.535	0.267	4
E	0.33	0.20	0.50	0.25	1.00	0.384	0.067	1
Sum						5.758	1.000	

Note: *W_i = 3 = 1.152, **W'_i = 1.152 / (1.152 + 1.919 + 0.768 + 1.535 + 0.384) = 0.2.

4.2.3 Calculate the eigenvalues (λ_max)

According to the obtained W'_i from Table 4, the largest eigenvalue of the Layer 2 can be calculated by:

$$\lambda_{max} = \frac{1}{n}\left(\frac{W'_1}{W_1} + \frac{W'_2}{W_2} + \ldots + \frac{W'_n}{W_n}\right)$$

Therefore, the λ_{max} of Layer 2 is 0.1736781.

4.2.4 Examine the consistency of pairwise comparison matrixes

Consistency index (CI) and consistency ratio (CR) are applied in this research to examine the consistency and reliability of pairwise comparison matrixes. The CI of Layer 2 is −1.2065850, which corresponds to CI ≤ 0.1, and the CR of Layer 2 is −1.077304, which corresponds to CR ≤ 0.1. As a result, the consistency of pairwise comparison matrixes in Layer 2 is affirmed.

4.3 Analysis of factors selection results

Calculation of the entire weight is based on three different kinds of assumptions. One of the methods is chosen to serve as the reference for final assessment of each factor. The results of the order of the three methods' weights are shown in Table 5.

Table 5 The order of the three methods

Assessment dimensional Layer 3	Partial inherence	Total inherence	Complete independence
A-1	10	8	10
A-2	14	9	14
A-3	6	7	6
B-1	13	15	13
B-2	16	16	16
B-3	11	14	12
B-4	5	13	4
C-1	9	6	15
C-2	3	4	2
C-3	8	5	5
D-1	7	10	3
D-2	15	12	7
D-3	12	11	8
E-1	4	3	11
E-2	2	2	9
E-3	1	1	1

According to the results in Table 5, the elimination method is first adopted and the factors that have large discrepancy are eliminated: A-2, B-4, C-1, D-1, E-1, and so on. As a result, the factors that have large discrepancy are analysed by the lateral analysis.

- A-2. Standardised production procedure involves entire production procedure, quality control, life cycle cost, etc. (Tao et al., 2017). As a result, factor A-2 is first taken into consideration; however, it is evident that the order of the total inherence doesn't correspond to real situations, but partial inherence and complete independence better fit in with practical application.

- B-4. Complementary marketing based on strategic alliances and D-1. Products development by cooperation between industries and academics are essential (Ankrah and Omar, 2015); however, enterprises should first achieve capabilities such as production, marketing and development to get the benefits of strategic alliances, so that the two factors may not be considered as priorities at this stage. On the contrary, the two factors in partial inherence and complete independence have lower order, which corresponds to enterprises' real situations.

- C-1. Establishment of the administration teams and E-1. Management of inventory and accounts receivable: these two factors are important competitive capability in enterprises' operation (Handfield et al., 2015; Kumar, 2016); however, they have lower weights in Layer 2 by total inherence, which affects factors in Layer 3. Therefore, the two factors are unable to be applied in real operation, and the associativity of total inherence and real situations is relatively lower.

In conclusion, we found that in lateral analysis factor A-2, B-4, C-1, D-1, and E-1 revealed that total inherence has larger discrepancy with enterprises' real operation. As a result, total inherence is not adopted in this research.

After total inherence is eliminated, the correspondence between partial inherence and enterprises' real situations are analysed to decide the final key factors and the conclusion. Under Daniel's theory, the best key factors for an industry is three to six, the first six factors are extracted to be analysed.

First of all, among the first six factors in partial inherence and complete independence, four of them, which refer to A-2, B-1, B-2, and B-3, are analysed by both partial inherence and complete inherence. It is clear that the discrepancy of the values calculated by partial inherence and complete inherence is small. In this research, four of the factors, A-2, B-1, B-2, and B-3, which are analysed by both partial inherence and complete inherence, are not discussed.

Next, two of the factors that are completely different from each other are respectively picked out from partial inherence and complete inherence, and they are: C-1, D-2, D-3, and E-1.

Following are the six KSF that are identified from the analysis:

- C-1. Establishment of the administration teams: As far as real enterprises' operations are concerned, enterprises often establish executive management teams to achieve their goals and performances (Handfield et al., 2015); moreover, it takes time and collaborative works to bring team members' recognition and concepts together. Factor C-1 is shown important because its order in complete independence is 15, and it corresponds to enterprises' operations.

- D-2. Achievement of mechatronic integration by applying IT techniques: In partial inherence, its order is 15, while in complete independence its order is seven. As far as real enterprises' operations are concerned, frequently timely release of products that meet demands cannot be achieved when mechatronics-integrated operations in the PPMI are in motion. Moreover, transfer of techniques, costs, after-sales services, etc. are not the factors that will be first taken into consideration. Therefore, it can be seen that the order of factor D-2 in complete independence is seven because it corresponds to enterprises' operations.

- D-3. Combination of European and American key techniques by establishing strategic alliances: In investigating the PPMI, there exist the problems of product development costs, the market positioning of the product and benefits distribution between strategic alliances when transferring European and American key techniques. As a result, the eighth order of factor D-3 in complete independence better corresponds to enterprises' real situations.

- E-1. Management of inventory and accounts receivable: In investigating the PPMI, because of the adoption of customised production plans which are based on build-to-order production, its production cycle is longer, and its need of liquid capital and management of inventory and accounts receivable are shown relatively important. Therefore, the 11th order of factor E-1 in complete independence better complies with enterprises' current situations.

The results from complete independence are better corresponds to enterprises' current decision according to the extraction of the PPMI's KSF. Based on the results from complete independence, the weights of 16 factors are put into orders, and divided into six groups, and a line graph is therefore formed, as shown by Figure 1. Factors that possess close values are classified into the same group, in which group 1 (0.100–0.120) contains B-2, C-1, and A-2, group 2 (0.080–0.100) contains B-1, B-3, and E-1 and so on.

Figure 1 Line graph of the weights of factors in complete independence
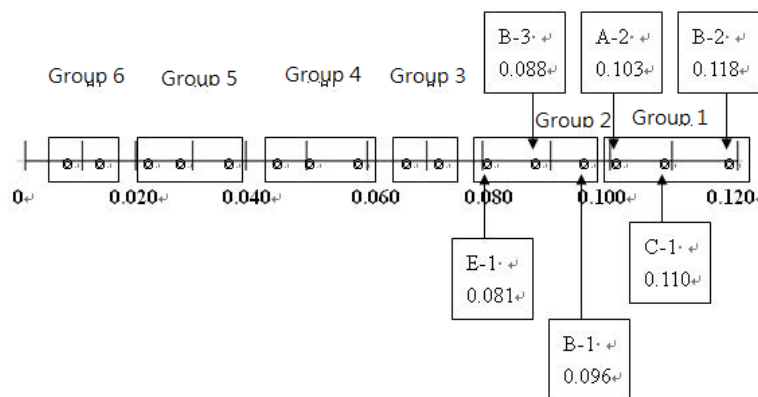
According to Daniel's theory, which stated that the best factors extracted to serve as the key successful factors of an industry is three to six, the key successful factors in group 1 and group 2 in Figure 1, which are six in total and meet the maximum amount of

extracted key successful factors, are picked out to be the key successful factors of the PPMI. They are: B-2, C-1, A-2, B-1, C-3, and E-1.

5   Discussions

In this study findings and implications of six factors that influencing the management of the PPMI in Taiwan are explained as below.

5.1   *B-2. Brand marketing based on customers' praises*

Since in the PPMI its product design has the expectancy of more than 20 year and its products belong to durable capital goods. Its' brand value can be established by words-of-mouth (WOM) marketing strategy after customers use its product and gets benefits using those products. Oral or written recommendation by a satisfied customer about a product or service is considered to be the most effective form of promotion (Chevalier and Mayzlin, 2006). PPMI industries should collect feedbacks from the customers to understand the views of customer, their needs and accordingly work on satisfying the customers. Reviews of products by the satisfied customer can be used for WOM advertising to create brands, thereby obtaining identification and trust from the market. Moreover, to establish its brand value, the design of its products should focus on speed and precision, and this achieves bang-for-the-buck effect and establishes its brands and WOM reputation. Such strategy can largely expand the market for the paperware packaging machinery industry and should be taken into consideration.

5.2   *C-1. Establishment of the administration teams*

The primary benefit of administrative team is that team members will be more focused on accomplishing its goals within the established timelines additionally administration team can perform faster decision making, cost savings, improved employee morale, and increased customer satisfaction (Krier, 2000). The role of chief executive are combining colleagues' talents, developing subordinates' ability, and self-adjusting according to change of phases in strategy to one who integrate things. Therefore, chief executive training courses should be setup and trained executives should be sent to every department to cultivate their communication ability and coordination. By setting up the executive team the cultures of an enterprise will take shape and the executive management team will perform according to the goal. Along with establishing administrative team the operation benefits such as fulfilment of strategies by administration of the entire team need to be monitored. Therefore, in annual strategy conferences, strategies and KPI should be setup, and in every season whether the effects of indexes is achieved or not should be assessed. To achieve positive operation benefits, the enforcement of strategies, administration, and a good executive management team counts a lot.

5.3   *A-2. Standardised production procedure management*

Enforcement of total quality management (TQM) is the key step in standardised production procedure because in the PPMI production cycle is long, capital turnover is

low, and related cooperation with its satellite factory is complicated. Integration of management works involves the process from the lists of every material to the accomplished delivery of products. Therefore whole process becomes the determinant of production efficiency and quality and costs of products as well as becomes the key point in enterprises' gaining profits.

5.4 B-1. Factory-aimed designed production mix

Considering the 'Made in Taiwan', reputation turn-key operation is the best strategy to attract new investors for the PPMI in Taiwan. However, the ability to provide industry and operation analysis based on investment and operation conditions is required. Moreover, participation of mechanical joint exhibitions held by Taiwan External Trade Development and understanding the local country's industries and market ecology are desirable. Customisation ability is the functional tool that requires integrating customer needs and good service quality. Taiwan is known as a country that possesses strong integration ability because of its multi-cultural understanding, which may help to apply customised turn-key operation for paperware packaging products. Turn-key operation strategy might be the main source of gains and the key competition ability of the PPMI.

5.5 C-3. Fine salaries, welfares, and incentive payment systems

Localised sales service system indicates that marketing and service are combined and forms a marketing network that unifies marketing and service. Therefore, widespread strongholds, such as in China, South-east Asia, Europe, and USA, establishment of fast service system, professional sales service ability, sufficient components, regular examination on the operation of service procedure, and training agents for repairing techniques are required to provide the value-added after sales services. Therefore these factors need to be considered by paperware packaging practitioners as localised sales service system should be the key successful factor of the PPMI.

5.6 E-1. Management of inventory and accounts receivable

Since the PPMI implements one year free service, the management of accounts receivable is shown essential. Therefore, recognition from customers for service, decrease of inventory and accounts receivable need to be considered. In addition, because of the time constraints of customised production, order scheduling, and materials purchases, the inventory management are also important part in cost management and the key successful factors of the industry. Due to various payment items, including checking fee, quality guarantee deposits, after-sales service fee, and components payment, regular collection of accounts receivable and control of accounts receivable are essential. Accordingly, the management of accounts receivable should be the key factor for PPMI to make profits.

As far as localised marketing service system and management of inventory and accounts receivable are concerned, good reputations, management of product quality, mature localised professional sale service system, collection of accounts receivable, and decrease of inventory rate are the most direct, economical, positive and effective improvement methods that need to be implemented by paper ware industries. Therefore,

it is evident that establishment of service systems is important to the PPMI. Paper ware machinery industry should also provide services for customers like: repairing service for remote networks, online checking service for safety stock quantity of components, on-the-spot safety stock quantity of components, standardised operation for repairing service procedures, annual repairing techniques training for domestic and overseas agents, producing repairmen service manuals, pre-sale proposal service for whole-plant soft wares and hardwires planning, technique and repairing training for whole-plant facilities operators, free one-year after-sales service, and non-man-made quality guarantee for one year.

To setup a service-oriented manufacturing industry, supports from professional and service oriented industry are needed when enterprises are building new plants, crossing into new industry, and so on. However, because the PPMI is the industry that has the features of whole-plant Turn-Key design and high service orientation, customers' needs should be prioritised so as to become the main stream in the future. Therefore, based on fast reflection service, old-fashioned thinking that the production industry should centre on production needs to be replaced by innovative thinking and innovative services and that will open the new opportunities to the PPMI.

6   Conclusions and future research

In conclusion, centring on fast and precise service systems and brand marketing will win customers' reputations. Production planning that focuses on services along with build-to-order product mix which is also one of the features' of Taiwanese industries' feature should be further exalted. In addition to the above mentioned key successful factors, 'establishment of the administration teams' is particularly essential. Efficient administration is highly desirable for functional management of production, marketing, service, research and development and financial management in order to gain profits.

The extracted six key successful factors from this research along with other success factors that might be faced in recent years can be tested in future work for paper ware packaging machinery industries in Taiwan and other countries. Also this methodology can be implemented in highly related service-oriented industries to find other KSF and test with appropriate sample size, when they are facing the need of changes.

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