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Assessing and ranking *HALMAS* parks in Malaysia

An application of importance-performance analysis and AHP

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240

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Abstract

Purpose – This paper aims to measure the level of importance and satisfaction on a number of items in the day-to-day running of the halal parks in Malaysia and to rank a selected halal parks on the basis of a number of performance criteria.

Design/methodology/approach – An importance-performance analysis (IPA) approach was adopted to focus on the areas requiring remedial actions for the halal parks. Further, the *HALMAS* (the accredited halal parks) parks ranking criteria have been identified and the absolute measurement process of analytic hierarchy process (AHP) has been applied to complete the ranking exercise.

Findings – IPA surfaced 16 items that require remedial actions for successful operations of *HALMAS* parks; these are related to infrastructure, facilities, logistics, local support authorities and the role of halal develop corporation. On the other hand, there were seven criteria to rank the *HALMAS* parks.

Research limitations/implications – Because of limited availability of data, the researchers could not rank all the 13 *HALMAS* parks in Malaysia rather only eight parks were evaluated.

Practical implications – The findings of the research were presented before the management of the parks and they shared their views that the findings gave them the clear road map of implementing improvement activities that will bring higher effectiveness in running the parks.

Originality/value – This is the pioneering attempt to rank *HALMAS* parks in Malaysia by applying a scientific method such as AHP. The type of application of a hybrid method (IPA and AHP) that is presented in the paper can also be extended to similar situations.

Keywords Importance-performance analysis, Ranking, Analytic hierarchy process, Halal industry

Paper type Research paper



1. Introduction

Halal industry is one of the fastest growing consumer segments in the world. At an impressive growth rate of 20 per cent, the industry is valued at an average of \$560bn a year. Presently, the industry is estimated to be of worth \$2.3tn. Over the years, the production line in halal industry has expanded. In addition to food items, now the industry includes cosmetics, pharmaceuticals, toiletries, health products and medical services. One of the contributing factors for this impressive growth is increasing awareness on ethical standard in the minds of Muslim consumers. Today, along with Muslim countries, many non-Muslim

countries are also embracing the concept of halal industry and the trend is on (Mathew *et al.*, 2014).

Compared to many other Muslim countries, Malaysia is well ahead in halal industry, specifically in promoting the industry through halal parks (Zailani *et al.*, 2017). For Malaysia, the journey of halal industry started in 1974 when Islamic Affairs Division in the Prime Minister's Department started issuing halal certificates to those companies which fulfilled the necessary criteria. In 2000, Malaysia reached its first milestone in halal industry when it published the halal standard, which is considered as the first documented and systematic halal assurance system. Eventually, this standard became a springboard and has played a pivotal role in pushing halal industry all over the world, and today it is an industry of global market value of \$2.30tn.

The Halal Industry Development Corporation (HDC) was set up in 2007 by the Ministry of International Trade and Industry to spearhead the government initiatives toward evolving Malaysia into a global halal hub. HDC works closely with the Malaysian Investment Development Authority and the Malaysia External Trade Development to attract potential investors into halal parks and in halal industries and services. It coordinates the overall development of the halal industry, with a focus on the development of halal standards, capacity building of halal products and services, as well as to promote and facilitate the participation of Malaysian companies in the global halal market. Halal parks have been conceptualised with the objective of improving the economic performance of participating companies, while minimising their environmental impacts (Talib *et al.*, 2015).

Among the other responsibilities of the HDC, one is to prevent pollution in halal parks, increase availability and accessibility to raw materials and ingredients, promote energy efficiency, facilitate intercompany linkages and institutional support, provide access to consolidated services from public agencies and facilitate linkages for promotion and marketing.

"Halal" is an Arabic word which means "permissible" or "lawful". It mainly refers to consumable items including food products, though it can also include non-consumable products such as cosmetic items. HDC defines halal parks as a community of manufacturing and service business located on a common property and forms an important building block for the halal industry. Different players are involved in a halal park at different stages. At the outset, the developer is entrusted with the authority to develop the park. An operator is designated to run the halal park and the tenant then occupies the park for manufacturing, service activities and logistics operations. The developer does not necessarily own the halal park but is responsible for its development in compliance with the different requirements and guidelines set by the relevant agencies and authorities. The developer has to observe the Malaysian halal certification requirements and follow the physical development guidelines as required by the local authority, the state authority, the department of environment and the fire brigade, as well as other relevant agencies (Talib and Hamid, 2014).

The operator is either a private or state-owned company and is responsible for ensuring the smooth operation of the park and the maintenance of its facilities. They look after the operational and the administrative management of the park, marketing, sales and leasing, as well as internal maintenance of the facilities. They play the role of intermediaries between the tenants and HDC. Operators benefit from different incentives, as they conform to the guidelines set by HDC. Tenants operate within the halal park. They occupy the park for manufacturing, logistics and other services activities. They choose to locate their businesses on a common park to enhance their environmental, economic and social performance through collaboration in managing halal products and using common resources available

therein. Halal industry players enjoy incentives from HDC upon fulfilment of a set of criteria. These incentives are exclusively designated for industry players in the following:

- specially processed food;
- cosmetics and personal care products;
- halal ingredients; and
- livestock and meat products.

HALMAS is an accreditation status given to operators, logistics companies and other tenant companies upon successful satisfaction of requirements as set in HDC halal parks development guidelines. It enables its beneficiaries to enjoy incentives made available through and managed by HDC. Currently, 13 halal parks have successfully met *HALMAS* requirements.

The dual objectives of this paper are to measure the level of importance and satisfaction on a number of items in the day-to-day running of the halal parks and to rank the performance of *HALMAS* parks on a number of criteria.

2. Previous works

2.1 Halal industry related

Wilson and Liu's (2010) view is that the halal industry's full potential is yet to be harnessed. The authors assert that the strategy and management of the industry should be broad and far-ranging and not myopic. Talib and Hamid (2014) performed a strength, weakness, opportunity, threats (SWOT) analysis of the halal industry, particularly in Malaysia and found that strong government support as the major strength and divergent definitions of halal as the major weakness of the halal industry.

Considerable research has been carried out regarding the halal supply chain. Manzouri *et al.* (2013) investigated the extent of lean management practices in the halal food supply chain and concluded that the application of lean concepts therein is still at its infancy. Zulfakar *et al.* (2014) identified the following factors that affect the integrity of halal food supply chain: halal certification, halal standard, trust among supply chain members, commitment of supply chain members, halal traceability and role of government.

Halal-certified food companies need to know how to approach halal supply chain. The research findings of Tieman (2011) provide some useful insights in this regards. The findings are also corroborated by Tieman and Ghazali (2014). In particular, the authors found that vulnerability in halal supply chain can be reduced through establishing halal control activities. Furthermore, vulnerability can be avoided by having dedicated logistics infrastructure, such as dedicated halal warehouse. In a recent review of literature, Talib *et al.* (2015) found that application of IT, logistics, especially transportation planning, government support, halal certification and halal traceability are some of the critical success factors of halal supply chain management.

Decision on warehousing services among halal manufacturers is an important one. Ngah *et al.* (2017) found that perceived benefits, cost, customer pressure and organisational readiness had significant relationships with halal manufacturers' intention to adopt halal warehousing services. However, the authors found supplier availability had negative relationship in the adoption of halal warehousing services (Ngah *et al.*, 2015). Aziz and Zailani (2016) investigated the role that ports play in halal supply chain. The authors found that the halal control and assurance activities conducted at ports and warehouses should be thoroughly inspected and that might enhance the performance of supply chain.

There are many issues and challenges in global halal marketing. [Abdul-Talib and Abd-Razak \(2013\)](#) contend that unless these challenges are addressed effectively, it will be difficult to establish the global halal market. The authors' suggestion is to use the concept of strategic marketing from the perspective of export market orientation behaviour. [Shah Alam and Mohamed Sayuti \(2011\)](#) used [Ajzen's \(1991\)](#) theory of planned behaviour (TPB) to investigate consumers' behaviour in purchasing halal food. They found all the three factors of TPB, namely, attitude, subjective norm and perceived behavioural control, have positive relationship with consumers' intention to purchase halal food products. [Khalek \(2014\)](#) also had the similar findings on young Muslim consumers in Malaysia. The study finds that subjective norm has less significant influences compared with attitude and behavioural control. The author's suggestion is to strengthen promotion and publicity of halal certifications issued by the Malaysia's Department of Islamic Development or JAKIM.

[Husain et al. \(2012\)](#) note that to realise the vision of Malaysian government to make the country as halal hub, the products are to be not only halal but also of very high quality. The authors recommend the halal food manufacturers to use quality control methods such as statistical process control. However, to produce high quality halal products, employees entrusted to those activities must possess the necessary skills. [Pahim et al. \(2012\)](#) found that, in Malaysia, the employees lack those skills. In the context of halal logistics industry, the researchers' findings indicate the training need on the parts of the employees and workers and proper training can significantly expand the halal export business.

Though halal products mainly concern to Muslims, however, because of their distinctive features, particularly hygiene, cleanliness and quality, the food items have huge potential in capturing non-Muslims as target market ([Mathew et al., 2014](#); [Rezai et al., 2012](#)). In a related study, [Yusof and Shutto \(2014\)](#) found huge potential of halal products in Japan. The authors conclude that to revitalise its economy, especially after the recent natural disasters, Japan needs a new sector of business, such as halal industry.

2.2 Analytic hierarchy process applications

Professor Thomas Saaty introduced the analytic hierarchy process (AHP) in 1977 ([Saaty, 1977](#)). During the past three decades, there have been many theoretical developments of AHP and the method has been applied in diverse areas ([Sipahi and Timor, 2010](#); [Vaidya and Kumar, 2006](#)). It has mainly been applied in selection, evaluation and ranking. Specific applications of AHP in various areas of management include strategic management ([Clinton et al., 2002](#); [Hafeez and Essmail, 2007](#); [Jieun et al., 2016](#)), human resource management ([Tsai et al., 2005](#); [Xian and Chen, 2011](#); [Kumar, 2016](#)), operations management ([HajShirmohammadi and Wedley, 2004](#); [Rangone, 1996](#); [Bohtan et al., 2017](#); [Prakash et al., 2017](#)), knowledge management ([Kazemi and Allahyari, 2010](#)), environmental management ([Duke and Aull-Hyde, 2002](#); [Lo et al., 2003](#); [Thakur and Ramesh, 2017](#)) and quality management ([Chow and Luk, 2005](#); [Crowe et al., 1998](#); [Min, 2010](#); [Badri et al., 2016](#)).

In terms of ranking, [Peniwati and Hsiao \(1987\)](#) showed how countries can be ranked using AHP. [Saaty \(1986\)](#) used AHP to rank the US cities in terms of liveability. [Faliagka et al. \(2012\)](#) used AHP to rank job applicants in online recruitment systems. The authors showcased the functionality of the integrated system through a real-world recruitment example.

To date, there has yet to be a research that ranks halal parks. The main objective of the present work is thus to apply IPA and AHP in the context of selected halal parks in Malaysia. IPA identifies the characteristics of halal parks that require examination, whereas AHP is used to rank the best performing parks.

3. Methodology

We begin by defining the basis for analysis, followed by extracting mean values and pairwise comparisons, after which we perform the gap analysis, then subject the data to the importance performance matrix, from which the rankings and areas for improvements emerge and, on that basis, recommendations are offered (Figure 1).

3.1 Stage 1: defining the basis for analysis

The goal of this stage is to identify the basis of analysis and understand the characteristics of halal parks. Information about halal parks was provided by the halal parks team and the general manager of strategic planning, HDC. The information requested from HDC consisted of the name of halal parks, developer, operator, contact details of the operator, year of establishment, year of operation and surface area of the parks. Based on the information received and discussions held with key personnel in the halal park team, the scope of halal parks was limited to *HALMAS* parks only because they are actively engaged with HDC, meet HDC criteria for *HALMAS* status and possess common characteristics useful for ranking purpose.

Two questionnaires were designed for collecting data from tenant companies on their perceptions about the importance and satisfaction (in this paper, the more suitable term “satisfaction” is used in lieu of “performance” of IPA) with the characteristics and services of *HALMAS* parks, as well as to compare the criteria that could be used to rank the parks. The

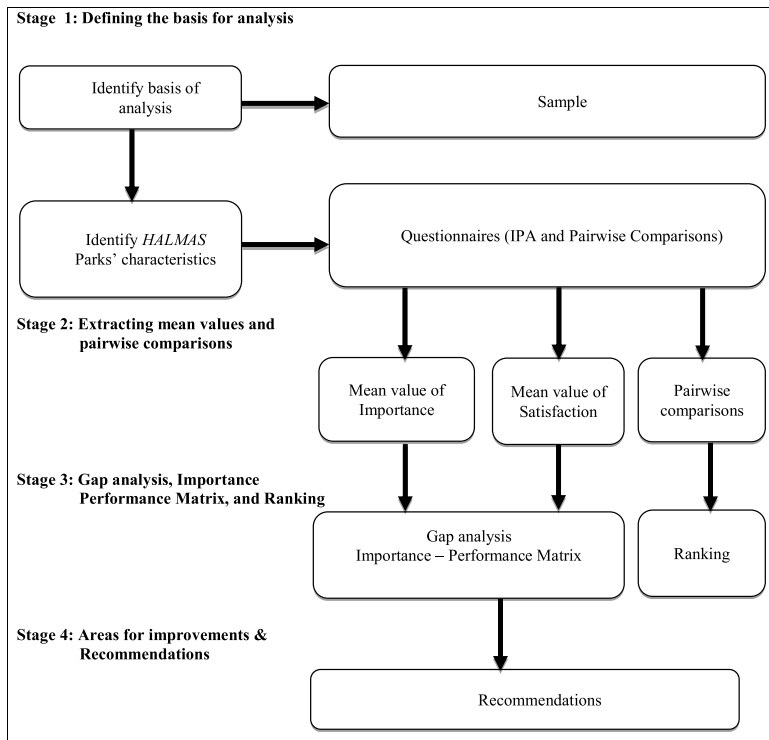


Figure 1.
Methodology of
the study

first questionnaire was directed at tenant companies operating from HALMAS parks to gather data on their perceptions and satisfaction with the parks.

The questionnaire was divided into two parts: demographics and importance-satisfaction survey. The second part comprised nine attributes, and each attribute was measured by a set of statements (Table I). Each statement was evaluated by the respondents to reflect the dimensionality of importance and satisfaction with what a HALMAS park offers.

Respondents were asked to evaluate the degree of importance on the left side of the questionnaire, and the degree of satisfaction on the right side. Respondents used a five-point Likert scale, ranging from 1 “Not at all important/Not at all satisfied” to 5 “Extremely important/Extremely satisfied”. Respondents were also given the option of a “Not applicable” response.

A total of 80 questionnaires were dispatched by courier on 27th May 2014 to nine HALMAS park operators. Follow up emails and phone calls were made after few days. In total, 45 completed questionnaires were returned by 9th July. However, only 36 questionnaires were complete and adequate for this study. The final response rate was 45 per cent, which was considered satisfactory for subsequent analysis.

The second questionnaire was designed for collecting the pairwise comparison data for ranking HALMAS parks. The ranking criteria considered in this study are “Transportation”, “Park Infrastructure”, “Facilities”, “Logistics”, “Promotion & Marketing”, “Development strategy” and “Economic Contribution”. Respondents were asked to choose a number on a scale “1 to 9” expressing his/her opinion on the relative importance of the suggested criteria. The Saaty ratio scale of 1 to 9 (Table II) was adopted for pairwise comparison of the criteria.

Items	No. of statements
Infrastructure and amenities	16
Facilities	18
Logistics	11
Raw materials	4
Local authority support	9
Park management	18
Manpower	9
HDC interaction	8

Table I.
List of attributes

Verbal judgment of importance	Numerical rating
Equal importance	1
Equal to moderate importance	2
Moderate importance	3
Moderate to strong importance	4
Strong importance	5
Strong to very strong importance	6
Very strong importance	7
Very strong to extremely strong importance	8
Extreme importance	9

Table II.
Saaty’s (1, 9)
ratio scale

Source: Saaty (1977)

3.2 Stage 2: extracting mean values

Importance and satisfaction means were calculated for each element and plotted with importance along the *y*-axis and importance along the *x*-axis. The point coordinates for each element determine its placement on the grid. Plotting mean ratings on the two-dimensional grid, which is termed the “Action Grid”, produced a four-quadrant matrix that identifies areas needing improvement as well as areas of effective performance.

3.3 Stage 3: importance-satisfaction matrix and gap analysis

The goal of this stage is to assess the importance and satisfaction of tenant companies with respect to the characteristics that define *HALMAS* parks. Importance-performance analysis (IPA) (here ISA) was formulated by [Martilla and James \(1977\)](#). This methodology was introduced as a way of understanding clients’ needs and desires so as to make good management decisions about how to respond to them ([Aigbedo and Paameswaran, 2004](#); [Huang and Wu, 2006](#)).

The major outcome of IPA is identification of a number of areas that require remedial actions. The underlying assumption of the IPA technique is that customers’ level of satisfaction with a product or a service is mainly derived from their expectations and judgment of product or service performance. The outcomes of the study encompass an analysis of the:

- importance placed by tenant companies on the characteristics of *HALMAS* parks;
- satisfaction of tenant companies with the performance of *HALMAS* parks; and
- steps undertaken to achieve an objective ranking of *HALMAS* parks.

3.4 Stage 4: areas for improvements and recommendations

The goal of this stage is to culminate the findings into recommendations with a focus on the aspects that need improvement. These recommendations would also highlight the areas that need further investigation to devise strategies on the basis of the findings obtained in this study.

4. Data analysis

4.1 Demographic information of the respondents

This study used SPSS and Excel to analyse the survey data and to produce a tabular and graphical presentation of the responses. In addition, Cronbach’s alpha for the group of items (importance and satisfaction) was found to be 0.966; this coefficient indicates that the questionnaire was adequately reliable. The survey questionnaires were completed by the designated employees representing their respective companies; 31 per cent of the respondents occupy the position of manager, followed by 14 per cent in administrative positions. The majority of the respondents reported working at their company for five years or less (80.6 per cent). This was followed by up to 15 years of work with the same company (16.7 per cent). The least percentage of respondents had worked over 20 years with their respective companies, comprising 5.6 per cent of all respondents. Moreover, the outcome of the retained questionnaires shows that tenant companies have been operating in *HALMAS* parks for an average of four years, with 14 per cent of tenant companies operating for over five years, whilst 86 per cent have spent less than five years in the parks. [Table III](#) provides the demographic information about all the respondents.

Demographic variable	Frequency	(%)	Assessing and ranking <i>HALMAS</i> parks
<i>Gender</i>			
Male	14	39	
Female	22	61	
<i>Occupation</i>			
Accountant	3	8	
Admin	5	14	
Director	2	6	
Executive	1	3	
HR Exec	1	3	
Manager	11	31	
Managing Director	1	3	
Operator	3	8	
Pengurus	3	8	
Production Manager	1	3	
Supervisor	4	11	
<i>Number of years worked in the respective company</i>			
Less than 1 year	8	22.2	
1-5 years	21	58.3	
6-10 years	4	11.1	
11-15 years	2	5.6	
Over 20 years	1	2.8	
<i>Years spent by tenant companies on a HALMAS park</i>			
1-5 years	31	86.1	
6-10 years	4	11.1	
11-15 years	1	2.8	

247

Table III.
Demographic profile
of the respondents

4.2 GAP analysis

The mean scores of importance and satisfaction with items regarding the criteria that characterise *HALMAS* parks are provided in [Table IV](#). The mean scores range from 3.33 to 4.47 for importance and 1.67 to 3.06 for satisfaction. The table also indicates the respondents' perception that all of the items surveyed were below their level of satisfaction (note the negative values for differences in mean scores).

The degree of difference in gaps varies. From the gap between means, we notice that there is a need to work harder to meet the expectations of tenant companies. The largest gaps (2.00 and more) between means are as follows:

- (HDC3) availability of incentives (−2.00);
- (HDC4) suitability of incentives to my needs (−2.03);
- (HDC5) diversity of incentives to meet my needs (−2.03);
- (LAS5) provision of public transportation from/to the park (−2.11); and
- (F12) availability of food outlets (−2.17).

On the other hand, the items with the lowest gap scores suggest that the current gaps are manageable, even though they are still below expectations. These include the following:

- (I12) availability of parking spaces for employees (−0.78);
- (I13) availability of parking spaces for visitors (−0.81);

Criteria/items	Mean value			
	Importance	Satisfaction	Gap	
<i>Infrastructure</i>				
I1	Proximity/accessibility to the nearest airport	3.33	2.11	-1.22
I2	Proximity/accessibility to the nearest port	3.94	2.22	-1.72
I3	Proximity/accessibility to highways	3.89	2.33	-1.56
I4	Proximity/accessibility to the nearest railway	3.39	2.08	-1.31
I5	Consistency of electricity supply	4.39	3.06	-1.33
I6	Consistency of water supply	4.47	2.94	-1.53
I7	Availability of natural/industrial gas supply	3.61	2.42	-1.19
I8	Availability of wastewater treatment facilities	3.83	2.67	-1.17
I9	Availability of drainage and flood protection system	3.83	2.86	-0.97
I10	Quality and consistency of telecommunication facilities	4.17	2.69	-1.47
I11	Availability of a guard house for a secured entry to/exist from the park	3.72	2.56	-1.17
I12	Availability of parking spaces for employees	3.78	3.00	-0.78
I13	Availability of parking spaces for visitors	3.75	2.94	-0.81
I14	Availability of designated parking areas for trucks	3.81	2.75	-1.06
I15	Availability of lighting on roads off the park	4.03	2.67	-1.36
I16	Clear signage to access the park	4.00	2.86	-1.14
<i>Facilities</i>				
F1	Presence of a one-stop centre with representation from relevant government agencies	4.14	2.53	-1.61
F2	Availability of customs and cargo inspection services	3.89	2.36	-1.53
F3	Availability of warehouse facilities	3.92	2.14	-1.78
F4	Availability of cold room facilities	3.78	2.11	-1.67
F5	Availability of slaughtering facility	3.47	2.00	-1.47
F6	Availability of R&D laboratory	3.83	1.86	-1.97
F7	Availability of traceability services	3.81	1.94	-1.86
F8	Availability of lab specialist testing lab	3.78	1.89	-1.89
F9	Availability of trucks scales facility	3.78	2.11	-1.67
F10	Availability of packaging facility	3.81	2.14	-1.67
F11	Availability of designated rest areas for employees	3.64	2.06	-1.58
F12	Availability of food outlets	3.83	1.67	-2.17
F13	Availability of ATMs	3.64	1.67	-1.97
F14	Availability of/proximity to hotel for visitors	3.58	2.08	-1.50
F15	Availability of accommodation in the park for employees	3.47	2.08	-1.39
F16	Proximity to residential housing	3.56	2.22	-1.33
F17	Maintenance of green areas and grass	3.64	2.53	-1.11
F18	Availability of designated areas for trucks	3.56	2.44	-1.11
<i>Logistics</i>				
L1	Availability of halal logistics operators in the park	3.78	2.39	-1.39
L2	Halal logistics operators offer integrated services required by my company	3.67	2.31	-1.36
L3	Halal logistics services assure the integrity of the halal supply chain	3.72	2.33	-1.39
L4	Monitoring and control of halal logistics operators by relevant authorities	3.75	2.36	-1.39
L5	Halal logistics operators ensure the halal status of trucks transporting my products	3.67	2.36	-1.31
L6	Halal logistics operators ensure the halal status of containers transporting my products	3.72	2.31	-1.42

Table IV.
Mean scores of
importance and
satisfaction

(continued)

Criteria/items	Mean value			
	Importance	Satisfaction	Gap	
L7	Halal logistics operators provide traceability services to track the halal status of products transported in containers	3.72	2.25	-1.47
L8	Halal logistics operators use technology innovation in warehousing, bar coding and transportation management systems	3.69	2.33	-1.36
L9	The availability of traceability system assures the halal integrity of my products during transportation	3.81	2.31	-1.50
L10	The availability of traceability system helps track the suppliers and the distributors of my products	3.64	2.22	-1.42
L11	The government Standards on halal logistics assure the halal integrity of my products	3.75	2.31	-1.44
<i>Raw materials</i>				
RM1	Availability of required raw materials	3.83	2.81	-1.03
RM2	Availability of information on the production capacity of the required raw materials	3.72	2.72	-1.00
RM3	Ease of importing the required raw materials from abroad	4.00	2.75	-1.25
RM4	Availability of raw materials in the park (raw materials produced by companies in the park)	3.64	2.56	-1.08
<i>Local Authority Support</i>				
LAS1	Suitability of incentives from local authorities	4.03	2.67	-1.36
LAS2	Availability of waste collection service in region/area around the park	3.81	2.53	-1.28
LAS3	Availability of hospitals and healthcare providers (clinics)	3.86	2.06	-1.81
LAS4	Sufficiency of housing supply to accommodate employees and their families	3.78	2.28	-1.50
LAS5	Provision of public transportation from/to the park	3.89	1.78	-2.11
LAS6	Availability of off-park roads lighting	4.03	2.50	-1.53
LAS7	Availability of police, fire and rescue stations	4.11	2.14	-1.97
LAS8	Availability of schools in area around the park	3.58	2.28	-1.31
LAS9	Availability of shopping outlets and supermarkets	3.69	2.08	-1.61
<i>Park Management</i>				
PM1	Availability of the operator of the park	3.94	2.81	-1.14
PM2	The operator maintains products and waster register to facilitate and identify inter-linkages among tenants	3.78	2.69	-1.08
PM3	The payment of park management fees	3.39	2.81	-0.58
PM4	The operator ensures the security of the park	3.94	2.58	-1.36
PM5	The operator ensures garbage collection	3.94	2.67	-1.28
PM6	The operator assists in applying for incentives	3.83	2.53	-1.31
PM7	The operator assists in applying for approvals & licensing	3.72	2.56	-1.17
PM8	The operator solves issues with relevant authorities	3.86	2.61	-1.25
PM9	The operator facilitates the promotion of the park	3.64	2.42	-1.22
PM10	The operator attracts new companies to the park	3.67	2.44	-1.22
PM11	The operator promotes the visibility of the park among investors	3.64	2.39	-1.25
PM12	The operator gathers operational and production data from tenants to facilitate by-product exchanges	3.47	2.53	-0.94
PM13	The operator ensures the supply consistency of utilities to the park (water, electricity, etc)	4.06	2.64	-1.42

(continued)

Table IV.

Criteria/items	Mean value		
	Importance	Satisfaction	Gap
PM14 The operator takes initiatives in identifying issues/problems faced by tenants	3.81	2.56	-1.25
PM15 The operator takes ownership in solving issues/problems faced by tenants	3.83	2.53	-1.31
PM16 The operator coordinates with local authorities to solve issues and problems	3.92	2.72	-1.19
PM17 The operator organises events to network with industry players of the park	3.56	2.53	-1.03
PM18 The operator proposes matching opportunities between industry players in the park and external suppliers	3.69	2.58	-1.11
<i>Manpower</i>			
MP1 Availability of local workforce	4.08	2.61	-1.47
MP2 Readiness of local workforce to take up jobs in halal industry	3.97	2.67	-1.31
MP3 Compatibility of local workforce knowledge with the halal industry requirements	3.86	2.78	-1.08
MP4 Availability of local workforce with technical qualifications	3.86	2.56	-1.31
MP5 Quality of local workforce with technical qualifications	3.83	2.69	-1.14
MP6 Flexibility of labour regulations	3.78	2.83	-0.94
MP7 Ease in recruiting foreign workforce	3.64	2.58	-1.06
MP8 Availability of a training centre in the park	3.69	2.56	-1.14
MP9 Involvement of operator in offering trainings for workforce	3.64	2.53	-1.11
<i>HDC initiatives</i>			
HDC1 Suitability of training workshops organised by HDC to my needs	3.97	2.19	-1.78
HDC2 Availability of HDC personnel to address your concerns	3.94	2.19	-1.75
HDC3 Availability of incentives	4.17	2.17	-2.00
HDC4 Suitability of incentives to my needs	4.14	2.11	-2.03
HDC5 Diversity of incentives to meet my needs	4.14	2.11	-2.03
HDC6 Availability of business matching opportunities	3.97	2.36	-1.61
HDC7 Frequency of dialogue opportunities with HDC personnel	3.92	2.19	-1.72

Table IV.

- (I9) availability of drainage and flood protection system (-0.97);
- (PM3) the payment of park management fees (-0.58);
- (PM12) the operator gathers operational and production data from tenants to facilitate by-product exchanges (-0.94); and
- (MP6) flexibility of labour regulations (-0.94).

4.3 Importance-satisfaction analysis

Mean scores for both importance and satisfaction data were then plotted as coordinates on the importance-satisfaction graph, as depicted in Figure 2. The two-dimensional graph is divided into four quadrants with satisfaction on the *x*-axis and importance along the *y*-axis. As a result, the four quadrants “Concentrate Here”, “Keep up the Good Work”, “Low Priority” and “Possible Overkill” are created. The quadrants are used to generate suggestions for HDC.

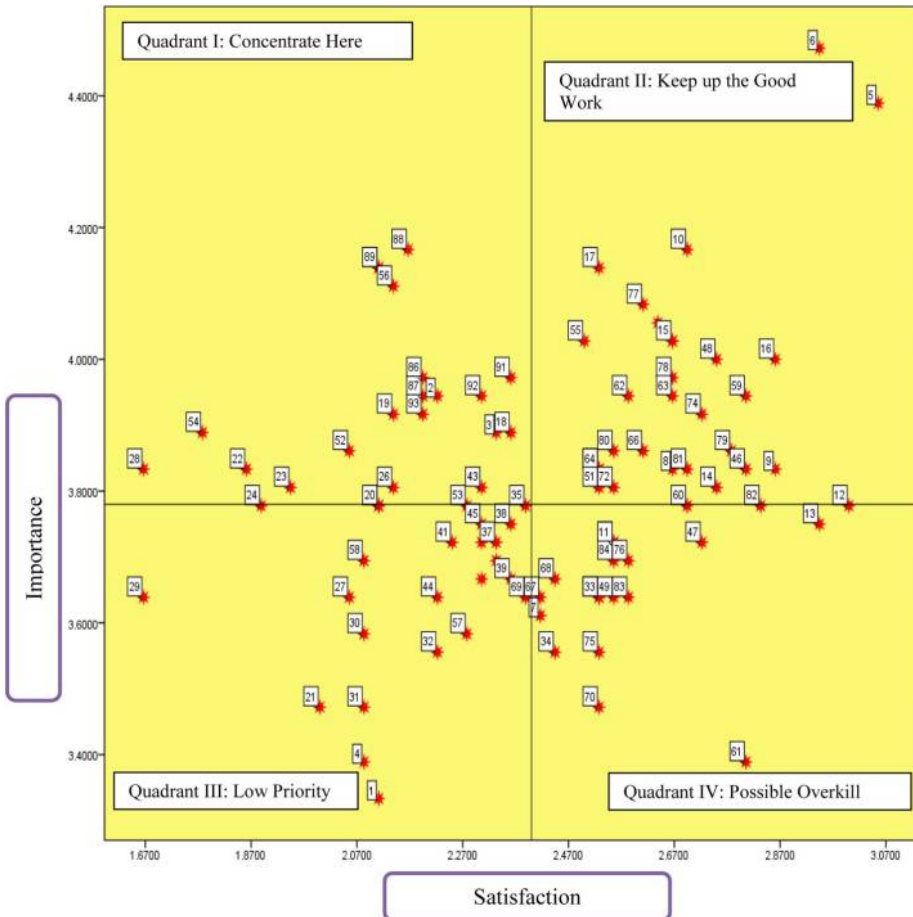


Figure 2.
Importance-satisfaction matrix

Quadrant I (high importance/low satisfaction) is labelled “Concentrate Here”. Elements that fall into this quadrant represent key areas that need to be improved with top priority. Items in Quadrant I (Concentrate Here) include the following:

- proximity/accessibility to the nearest port;
- proximity/accessibility to highways;
- availability of customs and cargo inspection services;
- availability of warehouse facilities;
- availability of R&D laboratory;
- availability of traceability services;
- availability of packaging facility;

- availability of food outlets;
- availability of hospitals and healthcare providers (clinics);
- provision of public transportation from/to the park;
- the availability of traceability system;
- suitability of training workshop organised by HDC to my needs;
- availability of HDC personnel to address my concerns;
- availability of incentives;
- suitability of incentives to my needs; and
- availability of business matching opportunities.

This means that respondents value the importance of these 16 items and others appearing in quadrant I above all other items. However, the way they perceive them as far as satisfaction derived from their performance is concerned is low; therefore, necessary actions are to be taken to improve their satisfaction.

Quadrant II (high importance/high performance) is labelled “Keep up the Good Work”. All that falls into this quadrant is considered to contribute to the strength of *HALMAS* parks.

- availability of wastewater treatment facilities;
- availability of drainage and flood protection system;
- quality and consistency of telecommunication facilities (broadband, data/voice/video communication services);
- availability of parking spaces for employees;
- availability of designated parking areas for trucks;
- availability of lighting on roads off the park;
- clear signage to access the park;
- availability of the operator of the park;
- the operator maintains products and waster register to facilitate and identify inter-linkages among tenants;
- the operator ensures the security of the park;
- the operator ensures garbage collection;
- the operator assists in applying for incentives;
- the operator solves issues with relevant authorities;
- the operator takes initiatives in identifying issues/problems faced by tenants;
- availability of local workforce;
- compatibility of local workforce knowledge with the halal industry requirements;
- availability of local workforce with technical qualifications;
- quality of local workforce with technical qualifications;
- availability of required raw materials;
- ease of importing the required raw materials from abroad; and
- availability of waste collection service in region/area around the park.

Quadrant III (low importance/low satisfaction) is labelled “Low Priority”. Thus, any of the attributes that fall into this quadrant are not important and do not require urgent attention.

- proximity/accessibility to the nearest airport;
- proximity/accessibility to the nearest railway;
- availability of cold room facilities;
- availability of slaughtering facility;
- availability of lab specialist testing lab;
- availability of/proximity to hotel for visitors;
- availability of accommodation in the park for employees;
- proximity to residential housing;
- availability of ATMs;
- availability of halal logistics operators in the park;
- the availability of traceability system that helps track the suppliers and the distributors of products;
- availability of schools in area around the park;
- availability of shopping outlets and supermarkets LAS;
- halal logistics operators provide traceability services to track the halal status of products transported in containers; and
- the operator promotes the visibility of the park among investors.

Quadrant IV (low importance/high satisfaction) is labelled “Possible Overkill”. It denotes attributes that are overly emphasised. HDC could reflect on these items, and instead of continuing to focus in this quadrant, they should allocate more resources to deal with attributes that reside in Quadrant I.

- availability of natural/industrial gas supply;
- availability of a guard house for a secured entry to/exist from the park;
- availability of parking spaces for visitors;
- maintenance of green areas and grass;
- availability of designated areas for trucks;
- availability of information on the production capacity of the required raw materials;
- availability of raw materials in the park (raw materials produced by companies in the park);
- the operator facilitates the promotion of the park;
- the operator attracts new companies to the park;
- the operator gathers operational and production data from tenants to facilitate by-product exchanges;
- the operator organises events to network with industry players of the park; and
- ease in recruiting foreign workforce.

4.4 Ranking *HALMAS* parks

Rankings are made based on quantitative data and qualitative judgments. For the purpose of ranking *HALMAS* parks, authors used the absolute measurement process of AHP, which

consists of comparing the alternatives (*HALMAS* parks) with an established standard. The various steps of absolute measurement are as follows:

- *Step 1* is to calculate the weights of the decision criteria by the relative measurement of the AHP.
- *Step 2* is to divide each criterion into several intensities or ratings, set priorities on the intensities by comparing them pairwise under each criterion and multiply these priorities by the priority of the parent criterion.
- *Step 3* is to pick one alternative at a time and judge its intensity under each criterion and add the global priorities of the intensities (i.e. the priorities of the intensities multiplied by the weight of the criterion concerned) for each alternative.

The steps of AHP provide an analytic support to the evaluation of *HALMAS* parks under a finite number of criteria and their subsequent ranks.

4.5 Criteria for ranking of HALMAS parks

HDC guidelines for the development of halal parks and FDI magazine for ranking economic zones were used to identify the set of criteria which could be applicable to *HALMAS* parks. An overview of seven criteria is presented in [Table V](#). Discussions with various people in HDC led to retaining the list of the criteria.

The complete AHP hierarchy is depicted in [Figure 3](#).

Code	Criteria	Meaning
TRS	Transportation	The connectivity of an industrial park is a key factor in locating a company onto the park. Both investors and tenant companies require different gateways to connect with their target markets and customers. This criterion refers to all types of gateways such as port, airport, highways, railways, paved roads
INF	Infrastructure	This criterion reflects the readiness of a park to meet the needs of tenant companies and prospective investors. It refers to the following a one-stop centre which would represent different government agencies and stakeholders such as customer, HDC, JAKIM, department of veterinary services, ministry of health, local council, and so on; cold rooms; warehouses; a training centre; parking lots, laboratory; and adequate supply of electricity, water, gas, high speed broadband, phone lines
FAC	Facilities	This criterion refers to security services, food courts, shops, Automatic Teller Machines, storage facilities, recreational facilities
LOG	Logistics	The presence of logistics infrastructure reflects the easiness of inbound and outbound movement of raw materials and finished goods produced on the park in accordance with halal standards and requirements
PRM	Promotion marketing	This criterion refers to the efforts deployed by the park management to attract new investors and favourably position the <i>HALMAS</i> park on the selection map of investors
DST	Development strategy	This criterion reflects the potential outlook of the park management on aspects of development and upgrading the park to stay competitive
ECO	Economic contribution	This criterion refers to the contribution of a <i>HALMAS</i> Park in the economic activity in terms of the percentage of jobs created by tenant companies operating on the park

Table V.
Proposed criteria for ranking of *HALMAS* parks

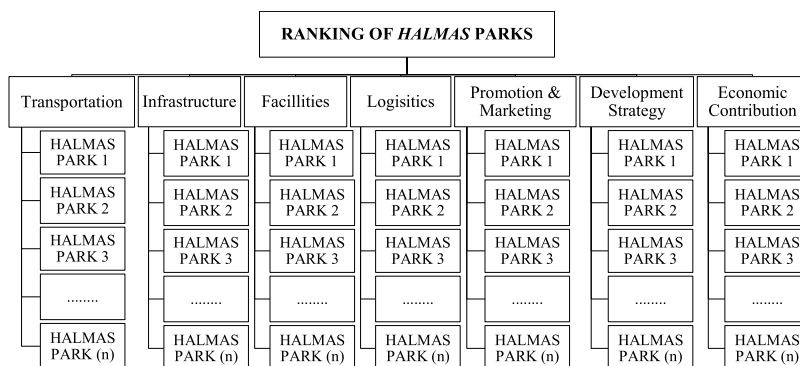


Figure 3. Hierarchic structure of criteria and alternatives

4.6 Pairwise comparison of criteria and determining their weights

The weights of the proposed criteria were determined by using the relative measurement procedure of the AHP. In total, 18 tenant companies were involved in the evaluation phase. The geometric mean was used to aggregate the judgments made by tenant companies. The entries in the pairwise comparison matrix (PCM) are the nearest integers of the aggregated values. The corresponding PCM and the weights are shown in Table VI.

After constructing the PCM, the authors proceeded to extract the weight for each criterion using the row-column normalization procedure. It is applied in the following three steps:

- (1) sum the values in each column of the PCM;
- (2) divide each element in the matrix by its column total. The resulting matrix is referred to as the normalised PCM; and
- (3) compute the average of the elements in each row of the normalised matrix.

The weights for all the PCMs were computed using Microsoft Excel. Inconsistent judgments by respondents might occur in the decision-making process. Table VII provides the steps to measure inconsistency in the PCM:

The average of the elements of the consistency vector is denoted by λ :

$$\lambda = \frac{7.36 + 7.28 + 7.39 + 7.36 + 7.33 + 7.46 + 7.32}{7} = 7.36$$

The consistency index (CI) is calculated using the following formula:

	TRS	INF	FAC	LOG	PRM	DST	ECO
TRS	1	3/7	3/4	3/5	1	4/7	3/4
INF	2 2/5	1	1	2	1	3/4	2 4/9
FAC	1 1/3	1	1	1 5/6	1 6/7	2	1 4/5
LOG	1 2/3	1/2	5/9	1	4/5	4/5	4/5
PRM	1 2/3	1	1/2	1 1/4	1	1/3	1 1/7
DST	1 3/4	1 1/3	1/2	1 1/4	2 4/5	1	2
ECO	1 1/3	2/5	5/9	1 1/4	7/8	1/2	1

Table VI. The general PCM for criteria

$$CI = \frac{\lambda - n}{n - 1} = \frac{7.36 - 7}{7 - 1} = \frac{0.36}{6} = 0.059$$

CI provides a measure of departure from consistency

The actual measure of consistency is determined by using consistency ratio (CR):

$$\text{Consistency Ratio} = \frac{\text{Consistency Index}}{\text{Random Index}}$$

or,

$$CR = \frac{CI}{RI} = \frac{0.059}{1.32} = 0.045$$

The values of RIs are predetermined and it depends upon the size of the PCM. The CR value is less than 0.10; thus, the amount of inconsistency present in the PCM is acceptable.

4.7 Intensities and their respective scores

In this study, the authors divided each criterion into six intensities. These are “Excellent”, “Very Good”, “Good”, “Average”, “Below average” and “Poor”. The comparative values of the intensities were computed by asking key HDC personnel the question:

- Q1. How good is “Excellent” with respect to “Very Good” for criterion transportation? Following Saaty’s preference scale, the respondents provided a value on a scale of 1 to 9. The same type of question was asked to compare other intensities.

The PCM for the intensities, namely, excellent (EX), very good (VG), good (G), average (A), below average (BA) and poor (P), and their corresponding weights are provided in Table VIII.

The authors then determined the global weights of the intensities for all the criteria by multiplying the weights of the criteria and the local weight of the intensities (Table IX).

Table VII.
Measurement of inconsistency

Criteria	Step (1)						Sum	Step (2)	
C1	0.095	0.076	0.154	0.064	0.125	0.106	0.078	0.699	7.355
C2	0.227	0.182	0.191	0.213	0.117	0.140	0.254	1.322	7.279
C3	0.125	0.193	0.203	0.199	0.230	0.359	0.188	1.497	7.389
C4	0.161	0.093	0.111	0.109	0.098	0.149	0.082	0.802	7.360
C5	0.161	0.194	0.109	0.139	0.124	0.066	0.118	0.910	7.327
C6	0.165	0.239	0.104	0.135	0.348	0.184	0.198	1.373	7.462
C7	0.126	0.074	0.112	0.138	0.109	0.096	0.104	0.758	7.322

Table VIII.
The PCM and local weight of the intensities

	EX	VG	G	A	BA	P	Weights
EX	1	2	3	5	7	9	0.384
VG	1/2	1	3	5	6	8	0.296
G	1/3	1/3	1	4	5	6	0.172
A	1/5	1/5	1/4	1	3	4	0.078
BA	1/7	1/6	1/5	1/3	1	3	0.042
P	1/9	1/8	1/6	1/4	1/3	1	0.028

Note: CR = 0.05

Criteria	Criteria weight	Intensities	Global weights of the intensities
Transportation	0.095	Excellent	0.0365
		Very good	0.0281
		Good	0.0163
		Average	0.0074
		Below Average	0.0040
		Poor	0.0027
Infrastructure	0.1820	Excellent	0.0699
		Very good	0.0539
		Good	0.0313
		Average	0.0142
		Below Average	0.0076
		Poor	0.0051
Facilities	0.2030	Excellent	0.0780
		Very good	0.0601
		Good	0.0349
		Average	0.0158
		Below Average	0.0085
		Poor	0.0057
Logistics	0.1090	Excellent	0.0419
		Very good	0.0323
		Good	0.0187
		Average	0.0085
		Below Average	0.0046
		Poor	0.0031
Promotion and marketing	0.1240	Excellent	0.0476
		Very good	0.0367
		Good	0.0213
		Average	0.0097
		Below Average	0.0052
		Poor	0.0035
Development strategy	0.1840	Excellent	0.0707
		Very good	0.0545
		Good	0.0316
		Average	0.0144
		Below Average	0.0077
		Poor	0.0052
Economic contribution	0.1040	Excellent	0.0399
		Very good	0.0308
		Good	0.0179
		Average	0.0081
		Below Average	0.0044
		Poor	0.0029

Table IX.
Global weights of
the intensities

4.8 Evaluation and ranking

In the last step, *HALMAS* parks have been evaluated by three evaluators who are familiar with *HALMAS* parks. The evaluators were asked to select the intensity of criteria for each *HALMAS* park. As there are three evaluators, the mean rule was used to aggregate their judgments. For example, three evaluators assessed the alternative Selangor halal hub against the criteria mentioned earlier. [Table X](#) shows the intensities given by the three evaluators for Selangor halal hub on the seven criteria.

[Table XI](#) presents the numerical equivalents for intensities.

The process of evaluating alternatives (*HALMAS* parks) required all evaluators to critically assess and determine the intensities that are most appropriate for each of them. Based on the intensities assigned by the three evaluators for each alternative, the authors converted them into numerical values. For example, the last column of [Table XI](#) presents the numerical equivalents of intensities for Selangor halal hub.

After collecting the evaluation forms, one of the evaluators was not familiar with the fourth *HALMAS* park, and thus it was eliminated from the exercise. Based upon the overall weights, [Table XII](#) provides the ranks of the alternatives. The evaluators placed PKFZ halal park in the first position, followed by Selangor halal hub and then POIC Tanjung Langsat.

The procedure described in this study could be extended to include additional criteria and more parks. Yet, the major challenge is to identify evaluators who have enough knowledge on all the parks under assessment.

Table X.
Evaluation of one alternative (Selangor halal hub) on the set of criteria

Selangor halal hub	Evaluator 1	Evaluator 2	Evaluator 3
Transportation	Good	Very good	Excellent
Park infrastructure	Very good	Good	Very good
Facilities	Very good	Good	Excellent
Logistics	Very good	Very good	Excellent
Promotion and marketing	Very good	Very good	Excellent
Development strategy	Very good	Very good	Good
Economic contribution	Very good	Very good	Very good

Table XI.
Numerical equivalents of intensities for Selangor halal hub

Selangor halal hub	Expert 1	Expert 2	Expert 3	Average scores on criteria
Transportation	0.0163	0.0281	0.0365	0.0270
Park infrastructure	0.0539	0.0313	0.0539	0.0463
Facilities	0.0601	0.0349	0.0780	0.0577
Logistics	0.0323	0.0323	0.0419	0.0355
Promotion and marketing	0.0367	0.0367	0.0476	0.0403
Development strategy	0.0022	0.0545	0.0316	0.0294
Economic contribution	0.0022	0.0308	0.0308	0.0213

Table XII.
Overall scores and ranking of *HALMAS* parks

Rank	Alternatives (<i>HALMAS</i> parks)	Overall score
1	PKFZ halal flagship	0.262702
2	Selangor halal hub	0.257473
3	POIC Tanjung langsung	0.242157
4	Penang international halal park	0.197944
5	Melaka halal park	0.196998
6	Perda halal park	0.166548
7	Pedas halal park	0.115715
8	POIC Lahad Datu	0.082304

5. Conclusions

Identification of the areas of improvement in day-to-day operations of *HALMAS* parks in Malaysia was the main purpose of the present work. With respect to the first part, the analysis of mean differences revealed that 16 items were performing below the expectations of tenant companies. These items are related to infrastructure, facilities, logistics, local support authorities and the role of the HDC. The findings, though valid for halal parks, can also be applied in other sector of halal industry, for example, halal supply chain. For the second section of this study, and on the basis of HDC guidelines, a set of criteria were compared by tenant companies. Afterwards, weighting criteria was pursued followed by aggregating global scores of criteria. The aggregated scores for *HALMAS* parks on various criteria allowed to perform ranking of *HALMAS* parks. PKFZ halal flagship park was placed on top of the list composed of eight *HALMAS* parks. The Selangor halal hub park was assigned the second rank, followed by POIC Tanjung Langsat. The findings of the research were presented before the management of the parks and they shared their views that the findings gave them the clear road map of implementing improvement activities that will bring maximum effectiveness in running the parks. Further works are necessary to link the halal park concept in Malaysia to other similar concepts practiced in other markets. Future studies may also be conducted to make comparisons of the best practices in managing halal industry across countries in the world market.

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