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A decision model for efficient service design in the sharing economy: a service triad perspective

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Abstract

Purpose – Sharing economy-based service platforms are a relatively new way of delivering services that have received increasing attention from both practitioners and researchers. However, current research in the area is still developing in terms of offering practical insight in conjunction with a decision model that may help to determine optimal strategies for efficient service design in the sharing economy from a service triad perspective. Exploring this gap in the literature, this paper aims to develop and apply a decision model that enables managers to identify and prioritise the efficiency attributes of sharing economy-based services. It also aids in designing optimal strategies to enhance efficiency over time based on the insights obtained from users (buyers and sellers) and platform providers.

Design/methodology/approach – This study adopts a mixed-methods approach. The qualitative approach comprised an extensive literature review followed by in-depth interviews, and the quantitative approach adopted the quality function deployment (QFD) integrated optimisation technique to design and prioritise the most optimal strategy emanating from the application of a decision model.

Findings – The findings revealed that establishing global distribution, continued technological research and development (R&D) and enhancing the transactional platform are the most important strategies in the context of sharing economy platform providers (e.g. accommodation-based-platform service providers). This study also revealed that as the importance weights of the efficiency attributes changed over time, so too did the portfolio of strategies used to attain an optimal efficiency level.

Originality/value – The decision model brings a richer conceptual understanding of the dynamic changes over time that occur in the business ecosystem. It also allows managers of sharing economy-based platforms to select optimal strategies and make astute decisions towards achieving efficient service design.

Keywords Sharing economy, Efficient service design, Decision model, Optimal strategy, Service triad

Paper type Research paper

Introduction

"Sharing economy" is an umbrella term encompassing phrases such as "open source", "commercial sharing systems", "product-service systems", "collaborative consumption", "peer-to-peer transactions" and "access-based consumption" (Belk, 2014) and that advocates temporary access to assets over permanent ownership (Cheng, 2016). The growing popularity of the sharing economy allows platform users to exploit their underutilised assets, thereby

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unlocking value and enabling greater efficiency and productivity within an economic system (Martin, 2016; Aloni, 2016). Underutilised assets (Aloni, 2016) and end users' resources are critical for the success of a scalable model of sharing economy-based business (Muñoz and Cohen, 2017). Further, the technological advancement and the changing nature of users' behaviours (Botsman and Rogers, 2010) to reduce their ecological impact (Schor and Fitzmaurice, 2015) have fostered sharing economy businesses as a viable means to pursue efficient resource integration and distribution.

The literature offers valuable insight into the decision-making aspects of the service industry. However, scholarly investigation into the decision modelling on determining optimal strategies for efficient service design in the unique context of the sharing economy is lacking (Abrate and Viglia, 2019). The efficiency of sharing economy service operations is a salient factor influencing the success and failure of a business (Lou and Koh, 2018a, b; Täuscher and Kietzmann, 2017). For example, Xu (2020) posits that transaction costs, particularly the information search and acquisition costs, play an important role in buying products in a sharing economy. Therefore, a decision model to determine the best strategies for efficient service design of a sharing economy-based service triad (SEST) is of the utmost importance. A majority of studies have focused on optimising the customer review (e.g. Biswas *et al.*, 2020) or performance outcomes of traditional accommodation service providers (Sellers-Rubio and Gonzálbez, 2009) using a single organisation perspective rather than taking the complexity and sometimes conflicting perspectives of each of the actors participating in the sharing economy. Moreover, empirical study into the development of a decision model for the efficiency of operations and performance optimisation of platform owners is scarce (Abrate and Viglia, 2019). Finally, Abrate and Viglia (2019) recommend stringent empirical research on the attributes of the efficiency of service providers within sharing economy-based platform businesses to efficiently gain deeper insight into effective service design. Considering these gaps in the literature, the current study argues that to broadly answer the question of efficient service design in the context of the sharing economy, scholars need to develop a decision model that could determine optimal strategies to enhance efficiency at the micro-level of the SEST that focuses on platform owners. However, a decision model that focuses on the efficiency attributes and strategies of SEST has received limited attention. Therefore, our study is committed to developing a decision model that (1) identifies the emerging efficiency attributes of SEST and (2) determines the optimal strategies that will help to address them.

Consistent with the aim of this paper, we developed a decision model that includes inputs and expectations from all three participants in the service triad: the end-user (customers), platform providers (resource integrators) and service providers (resource suppliers). We used a mixed-methods approach that combined both qualitative and quantitative techniques. For the qualitative approach, we conducted an extensive literature review to identify efficiency-related attributes from a SEST perspective using the service dominant (S-D) logic (Vargo and Lusch, 2004) as well as unified service theory (UST; Sampson and Froehle, 2006) as a foundation. Along with the literature review, interviews with peer customers, peer service providers and a technology platform provider were conducted to enable a comprehensive list of efficiency attributes. For the quantitative approach, we used the quality function deployment (QFD)-integrated non-linear optimisation technique (see Akao, 1990). Data were collected from accommodation-based sharing economy services in Australia.

The paper is structured as follows. The next section presents the literature review, and this is followed by the research methodology section. The results are then presented, followed by a discussion in which the theoretical and managerial implications are outlined. Finally, the conclusions of the study are presented.

Literature review

The inception of the sharing economy-based service enables platform users to efficiently use resources. However, efficiency in the sharing economy largely depends on the mechanism for exploiting underutilised assets and unlocking the value of assets by mobilising and ensuring maximum resource utilisation (Martin, 2016; Aloni, 2016). The efficiency of sharing economy service operations is a critical factor that determines the success and failure of a business (Täuscher and Kietzmann, 2017). However, scholarly investigation into the decision modelling on determining optimal strategies for efficient service design in the unique context of the sharing economy is lacking (Abrate and Viglia, 2019). Therefore, the current study offers a model (Figure 1) for enhancing efficiency in sharing economy-based service systems.

The foundation of our conceptual model relies on the concept of S-D logic (Vargo and Lusch, 2004) and UST (Sampson and Froehle, 2006). Customers are considered as providers of critical input according to UST and as co-creators of value following S-D logic – to accommodate individual preferences (namely, information, needs and desire) to address the heterogonous nature of service (Sampson and Froehle, 2006). However, UST focuses on the user-introduced variability (UIV), which reduces standardisation (Xu *et al.*, 2018) due to the inherent uncertainty of customers' input, knowledge and skill (Sampson and Froehle, 2006; Lou and Koh, 2018a, b) – this affects the efficiency of service delivery processes. Therefore, theorising about the interaction of S-D logic (Vargo and Lusch, 2004) and UST allows researchers to reconfigure an appropriate decision model for SEST.

In the conceptual model, to ensure efficiency, the current study demonstrates that the service design and delivery process begin with the identification of critical input related to efficiency from service users (WHATs), which aligns with the theme of the user focus approach and UST. Once efficiency attributes are explored, service providers need to design service delivery mechanisms/strategies (HOWs) to ensure efficiency and meet users' expectations. During the service delivery process, and based on the S-D logic, we argue that the service delivery mechanism requires joint input as well as a service value co-creation process involving all members in the service triad (user, platform provider and service provider). In sharing economy-based service systems, the scope for service co-creation in the service delivery process is broad. Therefore, the right combination of service design and delivery process will enable sharing economy-based service systems to optimise efficiency. In our model, we also argue that service design efficiency attributes influence both service delivery strategies and efficiency outcomes. Further, service delivery strategies influence efficiency outcomes. The bi-directional indications between service design, delivery strategy and efficiency outcomes infer that service design and delivery strategies are subject to change depending on efficiency outcomes. If efficiency outcomes do not conform to the desired level, the service design and delivery strategies need to be changed. Further, service

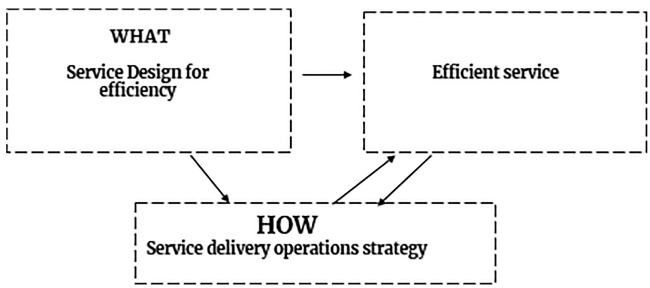


Figure 1.
Conceptual decision model of design for efficiency

design and delivery strategies need to be changed over time because of changes in the business environment as well as changes in expectations around desired outcomes.

The extant literature (e.g. Taylor, 2018; Lou and Koh, 2018a, b) shows that the efficiency of actors participating in SESTs is salient in the success of the sharing economy-based service process, as the efficiency of individual actors in the service triad does not lead to a successful outcome. Therefore, it is essential to explore efficiency in the sharing economy from an SEST perspective. The attributes of efficiency from the perspective of products and services are highly contextual and are explored in different contexts in the literature; however, there is a paucity of empirical research exploring and explaining the attributes of efficiency in the sharing economy from an SEST perspective. Following a systematic review of the literature, the next section outlines our findings on the attributes in the sharing economy from an SEST perspective and determines their priority in strategic decision-making.

Attributes of sharing economy-based service triad efficiency

Resources, cost, and time. Delay sensitivity directly decreases the customers' utility as waiting times are indirectly negatively affected through idleness (Taylor, 2018). Therefore, platforms respond to delay sensitivity by encouraging customers through decreasing per-service prices and encouraging participating agents through increasing per-service wages in a setting without uncertainty regarding the agents' opportunity costs or the customers' valuation (Taylor, 2018). Taylor (2018) indicates that customers prefer platform owners to manage the tension between customers and service agents towards identifying an optimal solution and allowing greater agent availability. However, this creates increased idle time in relation to the agents, which may affect their decision to accept the job if they are not compensated for the idle time (Singer and Isaac, 2015). Platform owners pursue transactions on the assets over internalisation by offering temporary access to the asset; consequently, the platform owner can achieve reduced tangible assets management and transaction costs, which eventually enables the platform to grow at a faster rate (Parentea *et al.*, 2018).

User and quality. Customers expect personalised and efficient services (Tam and Ho, 2005). However, service efficiency can decline due to reductions in standardisation and increases in operating costs when task complexity arises. In the context of SESTs, users of multi-sided platforms take on specific roles – that of buyers (customers), sellers (service providers) or both – further adding to the complexity of customer variability (Xu *et al.*, 2018). To improve operational efficiency, Xu *et al.* (2018) recommend internet-based platforms to control the UIV afforded to customers by deploying a standard input interface or by controlling the UIV introduced to the service technologies. Further, perceived ease of use encourages users to embrace new technologies to complete their tasks, resulting in an individual user's technology readiness (Ho and Ko, 2008) and preparedness in participating in service delivery (Dong *et al.*, 2015). Considering the context of bike-sharing services, user value co-creation is fostered by perceived ease of use of the technology, which leads to technology readiness and eventually results in real user participation (Lou and Koh, 2018a, b). Further, Lou and Koh (2018a, b) note that extra participation/voluntary effort to provide beneficial information or feedback on the asset may assist in preventing negative experiences among fellow users – for example, reporting damage or a defect to the service provider to allow recovery of or improvement to the service. The cooperation of the customer is critical for business success, as users' negative and opportunistic behaviours may exert serious influence on business efficiency (Hartl *et al.*, 2016).

Marketplace and network. Platform owners need to reduce the transaction cost between members through exploiting their economy of scale and increasing efficiency within the multisided marketplace to avoid assets being commoditised in a different marketplace (Montero and Finger, 2017). Seamans and Zhu (2017) argue that because of the multisided nature of the platform business, it is difficult for platform owners to design an optimal response for the competition. Moreover, different sides of the multisided market controlled by the platform are interdependent and, therefore, any strategic change in any one side of the market may necessitate a strategic change on the other side (Seamans and Zhu, 2017).

Members of a platform generally articulate their details, including qualifications and biographical information, to the platform to enable a higher level of trust between members (Ma *et al.*, 2017). Matching and searching algorithms play a vital role in executing the evaluation system within sharing-economy systems through algorithm-driven impartial judgement and analysis – although, a platform's ability to control user behaviour by altering algorithms also raises concern (Deng *et al.*, 2016). Platform owners deploy common rating systems and various evaluative features (i.e. user reviews) to allow collective supervision and assurance of interactions between members (Ikkala and Lampinen, 2015). Platforms often promote or restrict users carrying out transactions between themselves on the platform to improve and extend interactions across distant and anonymous users, where obtaining trust is an obstacle to accomplishing a successful transaction (Kim *et al.*, 2015). Platform owners need to carefully consider rewarding users by offering financial and non-monetary rewards such as credit score benefits (Zwass, 2010) to increase in-role commitment, resulting in users pursuing acts of altruism (Lou and Koh, 2018a, b).

Return. Platform owners can take advantage of their brokerage position within the multisided structure of the marketplace and generate revenue from both buyers and sellers using the platform (Seamans and Zhu, 2017). However, these platforms lack sufficient control over the participating parties and are subject to competition from a diverse range of markets, even from different industries. For example, Pinterest, which is used to create and share collections of visual bookmarks, faces competition for advertising dollars from search engines and social media platforms such as Google and Facebook.

Platform owners need to deploy significant effort to optimise users' searches and information costs to offer customised solutions through superior data analytics capability and market coordination (Sundararajan, 2016). They also need to increase their capacity to monitor transactions and effectively evaluate the scope of any possible risk to allow low commitment and a short-term contract (Sutherland and Jarrahi, 2018). On the other hand, in a situation where recurrent demands may occur, monitoring partners becomes costly, it may not be feasible and it may result in low retention rates, in turn causing the firm to fail due to the loss of users and revenue. As Tsui (2016) suggests, customers of both Uber and Airbnb are not repetitive in nature; therefore, the scope for performing transactions departing from the platform is limited.

Strategies to pursue efficiency in sharing economy-based service triads

Within the context of SESTs, efficiency is obtained through efficient operational integration (Parentea *et al.*, 2018), platform configuration (Seamans and Zhu, 2017), demand management (Eisenmann *et al.*, 2009) and network effect (Parentea *et al.*, 2018). SEST platform owners pursue operational integration by concentrating on the ownership of the virtual platform and developing core competencies on digitally enabled intermediation within the value chain (Parentea *et al.*, 2018). Platform owners need to consider investment in platform configuration initiatives such as enacting multiple code changes, redeploying their entire website, developing apps to consider a specific segment of user capabilities or devices, or introducing payment configuration for product adaptation at the platform level (Radhakrishnan, 2015). This can benefit the entire platform ecosystem – platform owners as well as their customers

(Parentea *et al.*, 2018). Platform configuration is necessary to accommodate changes and introduce new functionalities and features to cater for the heterogonous requirements of the participants in an efficient manner through designing, developing and deploying efficient algorithms and technological processes (Seamans and Zhu, 2017). Internet-based social interactive platforms and popular SESTs such as Uber and Airbnb can act as exemplars of efficient operational configuration and integration facilitated by robust technological infrastructure, complementary asset providers, local regulations and global adoption of internet and mobile devices (Parentea *et al.*, 2018).

Platform owners need to actively pursue effective and efficient demand management to match their customers' needs with potential providers as well as maintain growth (Eisenmann *et al.*, 2009). Offering benefits to members participating within sharing economy-based platforms can assist both the demand and supply sides with higher user adoption of the platform, which in turn is critical for the success of the platform (Reischauer and Mair, 2018). Montero and Finger (2017) suggest that a platform creates a positive externality by attracting a large pool of members on each side of the market. Platforms maintain openness on the supply side with reduced barriers for suppliers, which may result in greater alternatives for users to obtain higher customisation according to their requirements (Eisenmann *et al.*, 2009). Additionally, platforms may apply a competency check to ensure quality of service by the suppliers (De Stefano, 2015).

Positive growth of the network allows the platform to fairly distribute benefits across the members of both sides of the market, increasing the benefits derived from the indirect network effect. A platform's generative capabilities are facilitated by the modular nature of the platform architecture and a flexible governance regime (Eaton *et al.*, 2015), together with the method of increasing value creation to the user through a positive network effect (Parker *et al.*, 2016). For example, Uber attempts to draw a great deal of attention and generate consumer enthusiasm to influence its lobbying initiatives to regularise its business operations (Abboud and Wagstaff, 2015).

Platforms conduct direct surveillance on their participants' interactions and transactions using user-provided ratings or direct data collection to ensure quality (Deng *et al.*, 2016; Kuhn and Maleki, 2017) and by leaving ratings for other users (Eckhardt and Bardhi, 2015). This proactive platform intervention assists in cultivating a robust system of reputation and accountability across the platform, resulting in increases in individual participant trust in the platform's ability to operate and govern efficiently (Eckhardt and Bardhi, 2015). Kuhn and Maleki (2017) suggest that, through close monitoring, the platform may attempt to establish itself as a centralised mediator with authoritative presence, ensuring that in issues of fairness, security, management and pricing the standard rules and policies for the members of the platform are strictly adhered to.

The success of a platform-based service largely depends on achieving a critical mass, which eventually assists in gaining network effect, in turn resulting in economy of scale leading to efficiency (Parentea *et al.*, 2018). However, Täuscher and Kietzmann (2017) suggest that achieving critical mass within the network and managing high scalability cannot prevent failure in sharing-economy business. The authors concluded there was a lack of product-market fit, technological challenges, the inability to attract venture capital and flaws in the organisational design. Therefore, firms must integrate themselves with local partners to understand the complexity of the local context towards establishing credibility and deploying efficient business processes while pursuing globalisation (Busquets, 2018). Parentea *et al.* (2018) further clarify that platform owners should utilise superior data analysis to effectively deploy resources for marketing efforts and rely on local service providers for business adaptation.

Tables 1 and 2 present the findings in the extant literature on efficiency attributes and strategies.

Dimensions of efficiency	Actors within SESTs	Efficiency attributes
Resource (Rc)	Only buyers	Access to resource – Martin (2016)
	Only sellers	Asset utilisation – Martin (2016), Aloni (2016), Abrate and Viglia (2019)
	Platform owners	Deploying efficient processes – Busquets (2018); designing, developing and deploying efficient algorithms and technological processes – Seamans and Zhu (2017); information on users – Winterhalter *et al.* (2015)
Cost (C)	Only buyers	Search and information costs – Eisenmann *et al.* (2009); acts of altruism – Lou and Koh, 2018(a, b)
	Only sellers	Transaction costs of searching, contracting cost – Henten and Windekilde (2015); maintenance costs – Fraiberger and Sundararajan (2015)
	Platform owners	Designing, developing and deploying efficient algorithms and technological processes – Seamans and Zhu (2017); customer acquisition costs – Täuscher and Kietzmann (2017); investment in platform configuration – Radhakrishnan (2015); monitoring costs – Tsui (2016); costs of competency checking to ensure quality of service by suppliers – De Stefano (2015)
Time (T)	Only buyers	Time saving (less browsing; Komiak and Benbasat, 2006); waiting time (Singer and Isaac, 2015)
	Only sellers	Idle time (Singer and Isaac, 2015); speed and responsiveness (Busquets, 2018)
	Platform owners	Not applicable
Quality (Q)	Only buyers	Ease of use (Lou and Koh, 2018a, b); personalised services (Tam and Ho, 2005); task heterogeneity (Codagnone *et al.*, 2016); service defects (Seamans and Zhu, 2017)
	Only sellers	Service defects (Seamans and Zhu, 2017)
	Platform owners	Quality of service provision and risks (Constantiou *et al.*, 2017)
User (U)	Only buyers	Heterogenous mass (Kyprianou, 2018); customer participation (Dong *et al.*, 2015); users' in-role commitment (Lou and Koh, 2018a, b); acts of altruism (Lou and Koh, 2018a, b); buyer retention rate (Tsui, 2016); moral hazard (Benoit *et al.*, 2017; Hartl *et al.*, 2016); unreported damage (Hartl *et al.*, 2016); performing transactions that depart from the platform (Tsui, 2016); individual users' technology readiness (Ho and Ko, 2008); trust between members (Ma *et al.*, 2017)
	Only sellers	Heterogeneity of workers (Araman *et al.*, 2018; Codagnone *et al.*, 2016)
	Platform owners	Positive feedback cycle (Apte and Davis, 2019)
Marketplace (M)	Only buyers	More suppliers for buyers mean less cost and greater availability (Apte and Davis, 2019)
	Only sellers	More buyers mean more scope for revenue generation (Apte and Davis, 2019)
	Platform owners	Automation of transaction and algorithmic management (Yaraghi and Ravi, 2017); uncertainty about the quality-of-service provision and risks (Constantiou *et al.*, 2017); relationship with buyers and sellers (Li *et al.*, 2019)
Network (N)	Only buyers	Community participation (Reischauer and Mair, 2018)
	Only sellers	Access to greater number of buyers (Apte and Davis, 2019)
	Platform owners	Standardisation pattern governing their online community (Reischauer and Mair, 2018); network effect or network externalities (De Reuver *et al.*, 2018); critical mass (Parentea *et al.*, 2018)
Return (Rt)	Only buyers	User self-benefit, utility, trust, cost savings, familiarity, service quality and community belonging (Möhlmann and Zalmanson, 2017)
	Only sellers	Revenue generation (Seamans and Zhu, 2017); revenue maximisation (Abrate and Viglia, 2019); monetisation of resources (Forgács and Dimanche, 2016)

Table 1. Efficiency attributes and strategies of SEST actors presented in the extant literature

Methodology

Consistent with the research objectives and the conceptual decision model developed based on the literature review, the current study was conducted in several phases using a mixed-methods approach (i.e. qualitative and quantitative methods; Creswell *et al.*, 2003) to develop an empirical decision model towards enhancing efficiency attributes in service design for sharing economy-based-business ecosystems. The reason for using both qualitative and quantitative methods is that each of these methods has its own strengths in assuring the required data (Hohenthal, 2006), as well as ensuring the data's accuracy, quality, validity and reliability (Creswell *et al.*, 2003). Relying on a systematic process to develop the decision model, our study was conducted in three phases. Phase 1 involved the qualitative method

Table 2.
Strategies for platform owners relevant to efficiency-related attributes

Efficiency-related strategies for platform owners	Efficiency-related attributes Rc	T	C	Q	M	N	G	Rt
Platform configuration (Radhakrishnan, 2015)			*				*	
Operational integration (Parentea *et al.*, 2018)	*		*		*	*	*	
Development of two-sided marketplace (Sharam and Bryant, 2017)	*		*		*	*	*	*
Complimentary asset providers (Parentea *et al.*, 2018)	*		*	*	*	*	*	*
Open system (low/no barriers to entry; Eisenmann *et al.*, 2009; West, 2003)	*			*	*	*	*	*
Designing appropriate incentives for actors to follow the rules of the marketplace (Sharam and Bryant, 2017; Zwass, 2010)	*	*	*	*	*	*	*	*
Open rating system (Ikkala and Lampinen, 2015)				*	*	*	*	*
Marketing activities (Parentea *et al.*, 2018)	*		*		*	*	*	*
Complimentary service providers (Parentea *et al.*, 2018)	*		*	*	*	*	*	*
Integrating with local partners (Busquets, 2018)	*	*	*	*	*	*	*	*
Design optimal response for competition (Seamans and Zhu, 2017)						*	*	
Transparent, fairer transactions (Radhakrishnan, 2015)				*	*	*	*	
Superior data analysis (Sundararajan, 2016)	*	*	*	*	*	*	*	*
Monitoring of participants (Parentea *et al.*, 2018)	*		*	*	*	*		
Algorithm-driven impartial judgement and analysis (Deng *et al.*, 2016)	*	*	*	*	*	*	*	*
Creating consumer advocates (Abboud and Wagstaff, 2015)					*	*	*	*
Demand management (Eisenmann *et al.*, 2009)					*	*	*	*
Global expansion (Radhakrishnan, 2015)	*		*	*	*	*	*	*
Adaptations at the platform level (Radhakrishnan, 2015)	*	*	*	*	*	*	*	*

adopted for the study, while Phases 2 and 3 involved the quantitative method adopted. For the qualitative approach (Phase 1), we first explored the efficiency attributes (WHATs) and strategies (HOWS) revealed in the literature review and then verified those efficiency attributes and strategies against the findings from the interviews. Notably, the research problem related to efficiency attributes (WHATs) and the corresponding service delivery strategies (HOWs) in our model are highly commensurate with the QFD-based design method suggested by Chowdhury and Quaddus (2016). Therefore, the QFD-based service design method is highly effective in the operationalisation and quantitative analysis of our conceptual model. In Phase 2, we quantified and confirmed the different attributes and strategies studied using QFD. In Phase 3, we developed a binary integer non-linear optimisation technique to determine the best strategies for improving efficiency. The systematic process used to develop our decision support framework is presented below.

Phase 1

In Phase 1, using a qualitative approach, we identified the efficiency attributes (WHATs) and the strategies (HOWs) to enhance those attributes, in the sharing economy from an SEST perspective. Followed by the literature survey, context-specific data were collected from the six respondents – including the platform provider, resource supplier (service provider) and service receiver (consumers) – using a semi-structured interview protocol (Appendix 1). For data collection, we applied the principle of "*[continuation] until saturation of ideas*". Specifically, we stopped the interview process after collecting data from the sixth respondent because, during the last two interviews, we noticed that no new issues regarding attributes and strategies were emerging from the interviews. The interview duration was approximately 30–40 min. The respondents' demographic details are presented in Table 3.

Data collected from the interviews were analysed by applying the content analysis technique to the interview scripts. Based on the content analysis, a number of efficiency attributes, as well as strategies to enhance those attributes, were identified. The extracted attributes and strategies were compared with the attributes and strategies derived from the literature, and necessary amendments were performed to ensure content validity.

Phase 2

In Phase 2 of data collection, we selected the case company from among the companies interviewed in Phase 1. Our case company is a growing platform service provider in the accommodation-based sharing economy and has 20 staff and four years of operation experience. We interviewed (Appendix 2) with one of the company's decision-makers, an individual who has over 30 years' experience in different industries and different roles: travel industry IT (global distribution systems), accommodation marketing, finance and other commercial roles. Based on the data collected, we determined the importance weight of WHATs (W_i in Figure 2) using the best–worst method (see Rezaei, 2015), which is a popular multi-criteria decision-analysis technique to solve real-world problems. Using pairwise comparisons, the importance weights of different criteria were determined towards identifying the best alternatives for achieving the desired goal (Brunelli and Rezaei, 2019). After determining the importance weights of the efficiency attributes, we identified the importance of the strategies using QFD, which is a popular tool for translating the voice of a stakeholder into effective and efficient strategy design (Akao, 1990; Chowdhury and Quaddus, 2015). QFD utilises the house of quality (HOQ), which is a matrix that provides a conceptual map for the design process as a construct for understanding customer requirements (CRs) and establishing the priorities of design requirements (DRs) to satisfy CRs. The QFD problem can be formulated into a mathematical programming problem subject to limited resources (e.g. budget in an organisation; see Park and Kim, 1998; Chowdhury *et al.*, 2020, 2019, 2015). The systematic processes in QFD are illustrated below.

Step 1: Efficiency attributes (WHATs = CR_i) are identified.

Step 2: Relative importance ratings of WHATs ($= W_i$) are determined.

Step 3: DRs/strategies ($\text{HOW}_s = DR_j$) are generated.

Step 4: Relationships between WHATs and HOWs (R_{ij}) are determined.

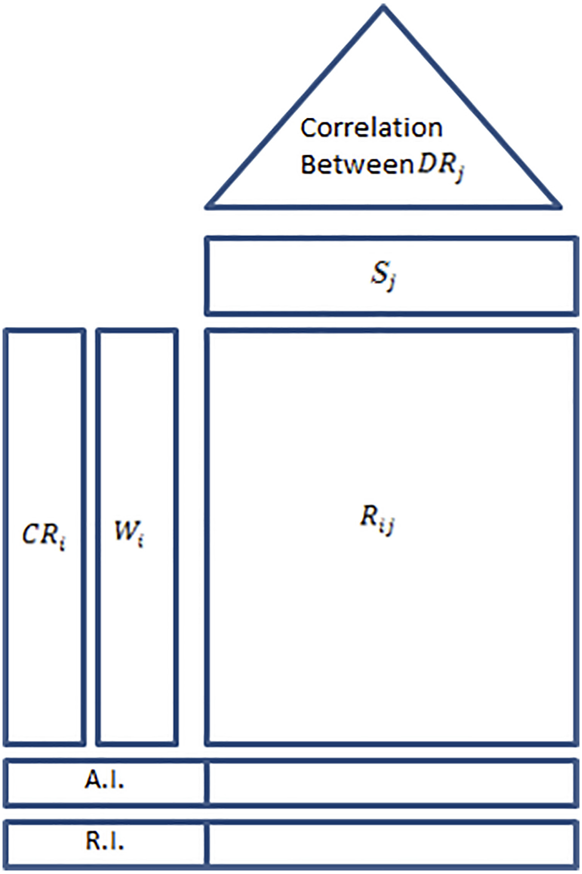
Step 5: Based on the WHAT–HOW relationship score, the weights (AI and RI) of HOWs are determined to rank the strategies.

Step 6: Relationships between HOWs are determined.

It is worth mentioning that to determine the WHAT–HOW relationship (R_{ij} value in Figure 2), we asked the decision-maker to identify the contribution of each strategy (HOW) to enhancing the efficiency attributes (WHATs) using the following scale: "strong = 9",

Participant	Participant type	Experience	Gender
P1	Platform provider	Seven years	Male
P2	Peer customer	Four years	Female
P3	Peer customer	Two years	Male
P4	Peer customer	Nine years	Female
P5	Peer service provider	Three years	Female
P6	Peer service provider	Five years	Female

Table 3. Respondents' description



Note(s): CR_i = customer requirements; W_i = degree of importance of CR_i's; S_j = design requirements/strategies; R_{ij} = relationship matrix (i.e., the degree to which CR_i is met by DR_t) A.I.= absolute importance of S_j's; R.I.= relative importance of DR_j's

Figure 2.
QFD approach

"moderate = 3", "little = 1" or "no = 0" (Park and Kim, 1998). These weights were used to represent the degree of importance attributed to the relationship. Thus, the importance of each strategy can be determined using the following equation:

$$AI_j = \sum_{i=1}^{m} w_i R_{ij} \quad \forall_j, j = 1, \ldots\ldots, n \tag{1}$$

where AI_j = absolute importance (AI) of the DR (DR_j), which is also referred to as strategies S_j; W_i = weight of the ***i***th efficiency attribute, which is derived using the best-worst method; R_{ij} = relationship value between the ***i***th efficiency attribute and ***j***th strategy requirement (9, 3, 1, or 0); n = the number of strategies; and m = the number of efficiency attributes.

Similarly, the relative importance of strategy j can be determined using the following equation:

$$RI_j = \frac{AI_j}{\sum_{j=1}^{n} AI_j} \tag{2}$$

where AI_j = AI of the S_j strategy, and $\sum_{j=1}^{n} AI_j$ = the summation of the AI of all strategies.

Phase 3

In Phase 3, we identified the most efficient strategies for enhancing the efficiency attributes using the optimisation technique. We asked the decision-maker about the cost of implementing each strategy and the company's budget to implement the most important strategies. The decision-maker was also asked about their cost savings from the simultaneous implementation of the strategies.

To determine the optimal strategies, we optimised the AI values of the strategies, subject to the budget constraints. For optimisation, we used non-linear binary integer programming. Cost savings from the simultaneous implementation of the strategies were derived from the roof matrix presented in Figure 3. The degree of interrelationships among the strategies in the roof matrix is represented by different symbols.

As mentioned earlier, we considered dynamic changes in the business environment and their impact on efficiency attributes and strategies over time; hence, the experiment was run considering the timeframe $n = 1$ to t. The optimisation problem can be formulated as follows:

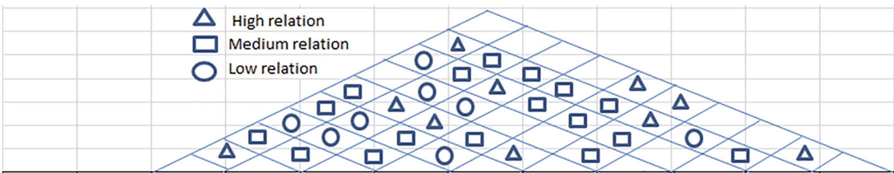
$$\text{Max} \int (x) \sum_{t=1}^{n} AI_{jt} x_{jt}$$

subject to $\sum_{j=1}^{n} c_j x_{jt} - \sum_{i=1}^{n} \sum_{j=i}^{n} s_{ijt} x_{it} x_{jt} \leq \text{B}$

$$0 \leq x_j \leq 1$$

$$x \in \{0, 1\}$$

where AI_{jt} is the AI of strategy x_j at time t; c_j is the expected cost of implementing the strategy x_j; s_{ijt} is the savings from the simultaneous implementation of strategy x_i and x_j at time t; and B is the budget available.



		St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
Atr1	0.277484	2.497357	0.832452	2.497357	1.942389	2.497357	2.497357	0.832452	1.942389	2.497357	2.497357
Atr2	0.325053	2.925476	0.975159	2.925476	2.27537	2.925476	2.925476	1.625264	2.27537	2.925476	1.625264
Atr3	0.055497	0.055497	0.277484	0.499471	0.499471	0.499471	0.499471	0.055497	0.499471	0.388478	0.16649
Atr4	0.023784	0.023784	0.023784	0.023784	0.071353	0.071353	0.118922	0.118922	0.071353	0.118922	0
Atr5	0.077696	0.233087	0.077696	0.077696	0.543869	0.233087	0.388478	0.388478	0.233087	0.388478	0.077696
Atr6	0.129493	0.129493	0.906448	0.906448	0.906448	1.165433	1.165433	0.647463	1.165433	1.165433	0.388478
Atr7	0.055497	0.055497	0.388478	0.16649	0	0.499471	0.499471	0.499471	0.16649	0.499471	0.499471
Atr8	0.055497	0.16649	0.499471	0.277484	0	0.499471	0.499471	0.499471	0	0.499471	0.499471
	A.I	6.086681	3.980973	7.374207	6.238901	8.391121	8.59408	4.667019	6.353594	8.483087	5.754228
	R.I	0.092329	0.060387	0.111859	0.094638	0.127285	0.130364	0.070794	0.096378	0.12868	0.087286
	Cost	250	250	200	75	700	1000	250	50	750	100

Figure 3.
Design of the efficiency model

A random optimisation experiment was conducted using randomly generated data based on the following six steps.

Step 1: Generate a random number for each efficiency attribute weight for time $t = 1$.

Step 2: Determine the importance of each strategy corresponding to the efficiency attributes.

Step 3: Determine the AI score for each strategy.

Step 3: Solve the model.

Step 4: Determine the optimal AI.

Step 5: Repeat Steps 1 to 4 for $t = 100$ times.

Step 6: Record and analyse the results.

It is worth mentioning that our optimisation model is also capable of considering the specific weights of the efficiency attributes rather than the random weights.

Application of the method in an Australian sharing-economy service

Phase 1 results

Table 4 summarises the interview results and gives the efficiency attributes and strategies identified from the interviews. Most of the efficiency attributes and strategies shown in Table 4 are consistent with the findings from the literature review, as shown in Tables 1 and 2.

Phase 2 results

Based on the in-depth interview results, we populated the best–worst matrix (see Rezaei, 2015) to prioritise the efficiency attributes and QFD matrix (see Akao, 1990) to determine the

Efficiency attribute findings (Art)	Extant literature
1. Asset utilisation	(Martin, 2016; Aloni, 2016)
2. Maximise revenue	Seamans and Zhu (2017)
3. Access to more uses (more suppliers/ customers)	(De Reuver *et al.*, 2018)
4. Save time	Busquets (2018)
5. Save costs	Seamans and Zhu (2017)
6. Ease of doing business	Lou and Koh (2018)
7. Ease of payment	(Yaraghi and Ravi, 2017; De Reuver *et al.*, 2018)
8. Secure system	(Perren and Kozinets, 2018; Breidbach and Brodie, 2017)
Strategies to enhance efficiency (St)	
1. Improving yield management	Zervas *et al.* (2017)
2. Customisable system in terms of payments and terms of trade	(Tam and Ho, 2005; Howcroft and Kåreborn, 2019)
3. Using data analytics to add value	Sundararajan (2016)
4. Target marketing	Parentea *et al.* (2018)
5. Transactional platform	Radhakrishnan (2015)
6. Global distribution	(Radhakrishnan, 2015; Winterhalter *et al.*, 2015; Martin, 2016)
7. Workflow automation	(Howcroft and Kåreborn, 2019; Sutherland and Jarrahi, 2018; Finne and Holmström, 2013)
8. Pay on performance business model	Datta and Roy (2011)
9. Technological R&D	Loureiro (2017)
10. Ensuring security	Perren and Kozinets (2018)

Table 4.
Efficiency attributes and strategies

importance weights of the strategies. Figure 3 presents the weights of the efficiency attributes (WHATs) and strategies (HOWs).

Figure 3 shows the importance weights of the efficiency attributes, ranging from a low of 0.02378 (Attribute 4) to a maximum of 0.32505 (Attribute 2). It is also evident from Figure 3 that the AI values of the service design strategies range from a low of 3.9809 (for ST2: Customisable system in terms of payments and terms of trade) to a maximum of 8.594 (for ST6: Global distribution).

In this phase, we also determined the interrelationships between the strategies (HOWs) by interacting with the DM of the case company, shown in Figure 3. For example, St_1 and St_2 were found to have a very strong relationship. Thus, substantial savings might be achieved if these strategies are implemented together. Throughout this process, we also obtained the estimated cost savings (S_{ij}) of implementing strategy i and j together. The cost-savings matrix is shown in Table 5. Table 5 shows the savings from Strategies 3 and 4 ($S_{3,4}$) = 25 (in 000) AUD. Similarly, we populated the other elements of the cost-savings matrix.

Phase 3 results

After collecting the relevant data for optimisation, we attempted to find an optimal strategy by solving the optimisation problem. The optimisation problem can be formulated as follows:

$$\text{Max} f(x) = \sum_{j=1}^{n} AI_{jt} x_{jt}$$

subject to: $c_1x_{1t} + c_2x_{2t} + c_3x_{3t} + c_4x_{4t} + c_5x_{5t} + c_6x_{6t} + c_7x_{7t} + c_8x_{8t} + c_9x_{9t} + c_{10}\ x_{10t} + S_{1,9}$ $x_{1t}x_{9t} - S_{2,6}x_{2t}x_{6t} - S_{2,9}x_{2t}x_{9t} - S_{3,4}x_{3t}x_{4t} - S_{3,6}x_{3t}x_{6t} - S_{3,9}x_{3t}x_{9t} - S_{4,6}x_{4t}x_{6t} - S_{5,7}x_{5t}x_{9t} - S_{7,9}x_{7t}x_{9t} -$ $S_{9,10}x_{9t}x_{10t} \leq 2000$

$$x_j = 0,\ 1,\ \text{t} = 1 \text{ to n}$$

The $AI_{j,}$ and c_j are available from Figure 3, and the s_{ij} values are available in Table 5. Available budget B is US$2,000 (obtained from the case company). The results of the optimisation are presented in Table 6, along with those of the sensitivity analysis conducted. In a real-life scenario, the weight of the efficiency attributes changes over time depending on the context. For this reason, we employed an optimisation model that considered the changing weights of the efficiency attributes and then we generated 100 random instances (changing the criteria weight). As an example of sample, ten instances are presented in Table 7.

The results from the random experiments show that companies can change the optimal portfolio of strategies over time to keep pace with dynamic changes in the business

St_s	St_1	St_2	St_3	St_4	St_5	St_6	St_7	St_8	St_9	St_{10}
St_1	0	0	0	0	0	0	0	0	50	0
St_2	0	0	0	0	0	50	0	0	50	0
St_3	0	0	0	25	0	50	0	0	25	0
St_4	0	0	0	0	0	50	0	0	0	0
St_5	0	0	0	0	0	0	50	0	50	0
St_6	0	0	0	0	0	0	0	0	0	0
St_7	0	0	0	0	0	0	0	0	50	0
St_8	0	0	0	0	0	0	0	0	0	0
St_9	0	0	0	0	0	0	0	0	0	25
St_{10}	0	0	0	0	0	0	0	0	0	0

Table 5.
Cost-savings matrix

Table 6.
Optimisation results with the scenario analysis for different budgets

Strategies	*St1*	*St2*	*St3*	*St4*	*St5*	*St6*	*St7*	*St8*	*St9*	*St10*	OFV	Budget
RI	0.092	0.060	0.111	0.094	0.127	0.130	0.070	0.096	0.128	0.087		
Costs (*Cj*)	250	250	200	75	700	1,000	250	100	750	100		
Decision variable	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10		
Implementable strategies	1	1	1	1	0	0	1	1	1	1	0.742	2000
	1	1	1	1	0	0	1	1	1	1	0.742	1800
	1	0	1	1	1	0	1	1	0	1	0.680	1,600
	1	1	1	1	0	0	1	1	0	1	0.613	1,400
	1	1	1	1	0	0	1	1	0	1	0.613	1,200
	1	0	1	1	0	0	1	1	0	1	0.553	1,000

Note(s): OFV = objective function value environment. Table 7 shows ten such instances, with different strategic portfolios at different weights of the efficiency attributes.

Discussion and implications

Summary of the results

The results from the qualitative study in Phase 1 indicate that there are eight service attributes important to SEST members, and these attributes are consistent with those outlined in the literature (Table 4). Among the efficiency attributes, maximise revenue, asset utilisation and ease of doing business were shown to be the most important. Further, we found that three strategies, St6, St9 and St5 (i.e. establishing global distribution, continued technological R&D and enhancing the transactional platform, respectively) were the most important. These strategies are consistent with those outlined in the relevant literature (Martin, 2016; Radhakrishnan, 2015; Winterhalter *et al.*, 2015).

In Phase 2, we also revealed the associations between the strategies, shown in Figure 3. The strategies St_1 and St_2 (i.e. improving yield management and customisable system in terms of payments and terms of trade), St_2 and St_6 (i.e. customisable system in terms of payments and terms of trade and establishing global distribution), St_3 and St_6 (i.e. using data analytics to add value and establishing global distribution), St_1 and St_9 (i.e. improving yield management and continued technological R&D), St_3 and St_8 (i.e. using data analytics to add value and pay on performance business model), St_6 and St_9 (i.e. establishing global distribution and continued technological R&D), St_5 and St_{10} (i.e. enhancing the transactional platform and ensuring security), and St_9 and St_{10} (i.e. continued technological R&D and ensuring security) were found to have very strong relationships. Thus, substantial savings are likely to be achieved if these strategies are jointly implemented.

In Phase 3, the results of the optimisation model show that all except Strategies 5 and 6 (i.e. enhancing the transactional platform and establishing global distribution) can be implemented within the limited budget (US2000,000; Table 6). Though Strategies 5 and 6 are very important, the cost of their implementation is high. Managers should undertake a sensitivity analysis to observe how changes in the budget level influence the strategy implementation and efficiency goals of the organisation. Additionally, in Phase 3, we found that due to changes in the business environment, the importance of the efficiency attributes also changed, which led to changes to the portfolio of strategies (Table 7). This addressees' dynamic changes in business strategies based on changes in business environments (Chowdhury *et al.*, 2019). It also highlights the necessity of stringently investigating efficiency-related attributes within SESTs and their priorities towards enabling the managers of platform owners to design effective strategies to achieve their desired efficiency.

Instances	RI score	St1	St 2	St 3	St 4	St 5	St 6	St 7	St 8	St 9	St 10
1	0.72661	1	1	1	1	0	0	1	1	1	1
2	0.73528	1	1	1	1	0	1	1	1	0	1
3	0.73745	1	1	1	1	1	0	1	1	0	1
4	0.72351	1	1	1	1	0	0	1	1	1	1
5	0.72548	0	1	0	1	1	0	1	1	1	1
6	0.73632	1	1	1	1	0	0	1	1	1	1
7	0.72739	1	1	1	1	1	0	1	1	0	1
8	0.72302	1	1	1	1	0	0	1	1	1	1
9	0.68301	0	1	1	1	0	1	1	1	0	1
10	0.73427	1	1	1	1	0	0	1	1	1	1

Table 7. Changes in the strategy portfolio with the changing weights of the efficiency attributes over time

Theoretical contributions

Our study offers several theoretical contributions. First, the current study responds to the call for "success factors for different platform types [the service triad perspective of the provider, receiver and platform owner] . . ." (Wirtz *et al.*, 2019, p. 347). Specifically, we leveraged the service triad perspective to advance our understanding of the sharing economy, as very few studies have investigated the efficiency attributes and strategies of SESTs. Second, we developed a decision model that is capable of determining the most important efficiency attributes and selecting optimal strategies to enhance efficiency at the micro level of SESTs that focuses on platform owners. To the best of our knowledge, no previous study has developed this kind of decision model for enhancing the efficiency of sharing economy-based service platforms. This move addresses the call for research by Abrate and Viglia (2019) to develop a decision model for determining optimal strategies towards achieving efficiency that follows the sharing economy perspective. Third, the decision model was designed following the principles underpinning the S-D logic and UST, and uses the popular strategy design tool QFD, which was applied here for the first time (to the authors' knowledge) within the context of the sharing economy. Therefore, theorising around the interaction between the S-D logic and UST, together with the application of QFD, could lead to the reconfiguration of an appropriate decision model for SESTs (Lou and Koh, 2018a, b; Täuscher and Kietzmann, 2017).

Managerial implications

Our results have clear implications for sharing-economy platform providers, specifically accommodation-based-platform service providers, in their identification and emphasis on efficient service design priorities. This can help them make better use of resources and enable them to deliver and align service design strategies with the service delivery strategies. The decision model developed in our study revealed a wide range of attributes and their corresponding strategies towards ensuring efficient service design in a sharing economy is achieved. Platform providers (e.g. accommodation-based platform service providers) can use this model not only to identify the efficiency attributes but also prioritise those attributes in situations where resources (e.g. funding, time) are scarce, as they are in this context. Further, the decision model will allow platform providers (e.g. accommodation-based platform service providers) to determine the optimal strategies needed to operationalise their required attributes. Such optimal strategies will also help to test alternative sets of optimal strategies in different scenarios, which in turn can help to minimise cost. Our decision model can additionally assist managers to change their service designs and delivery inputs to respond to the efficiency goals of their respective organisations.

Conclusions and future directions

The decision support framework developed in the current study is unique in its application in the context of sharing and providing managers with an instrument that facilitates the selection and prioritisation of optimal strategies towards enhancing efficiency in service delivery operations in different business environments and temporal settings. Ultimately, this research offers some food for thought for the management of the case companies, especially in terms of improving efficiency in service delivery operations.

This study has several limitations that provide opportunities for future research. Although the qualitative approach to data collection in this study took input from multiple respondents from different service value network members, the quantitative case study was conducted with only a single company, as the detailed data collection methods for the QFD methodology are extremely resource-intensive. Notably, in the context of Australia, there are a limited number of accommodation-based platform service providers. Therefore, we had limited scope to locate any other accommodation-based platform service providers. Thus, replicating the current study with a contrasting company would be ideal. Accordingly, even devising a more suitable research methodology that is less resource-intensive may facilitate generalisability. Further research could also be conducted with a larger sample size using the survey method so that statistical inference can be drawn to establish the relationship between efficiency attributes and strategies – as well as the interdependence between the strategies. Future research may also focus on identifying the antecedents and causal conditions of efficiency in a sharing economy context. Firms may focus more on some efficiency attributes compared with others at different lifecycle stages. Therefore, it is important to understand the importance of efficiency attributes at different stages of the lifecycle, such as a firm's introduction, its growth and maturity. Thus, our future research will endeavour to develop an interactive decision support framework (interacting with decision-makers) to identify the weights of firms' efficiency attributes by interviewing decision-makers from different firms operating at their introduction, growth and maturity stages, before identifying the corresponding changes in the optimal strategy portfolio.

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Further reading

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Appendix 1
Semi-structured interview protocol

- In your opinion, what are the attributes of operational efficiency (for example, attributes related to time, cost, quality and market growth) in the sharing economy context (e.g., Airbnb)? Please list these attributes below.
  1.
  2.
  .
  n

- In your opinion, what are the strategies (for example, improving research and development, increasing promotional efforts) to enhance operational efficiency in the sharing economy context? Please list these strategies below.
  1.
  2.
  .
  n

Appendix 2
Questionnaire

Question 1

Dear Respondents:

From the literature review and interview, we have identified the following efficiency attributes and strategies for enhancing efficiency in a sharing-economy-based service.

Efficiency attributes
1. Asset utilisation
2. Maximise revenue
3. Access to more uses (more suppliers/customers)
4. Save time
5. Save costs
6. Ease of doing business
7. Ease of payment
8. Secure System
Strategies to enhance efficiency (St)
1. Improving yield management
2. Customisable system in terms of payments and terms of trade
3. Using data analytics to add value
4. Target marketing
5. Transactional platform
6. Global distribution
7. Workflow automation
8. Pay on performance business model
9. Technological R&D
10. Ensuring security

Question 1

Based on the list of efficiency attributes and strategies mentioned above, please fill in the following:

Select the best/most important attribute	

Select the worst/least important attribute	

Compare the most important to others in a scale of 1–9*	Att 1	Att 2	Att 3	Att 4	Att 5	Att 6	Att 7	Att 8
Comparison rating								

*1= Least important & 9 is the most important

Others to the worst/least important attribute	Comp arison rating
Attribute 1	
Attribute 2	
Attribute 3	
Attribute 4	
Attribute 5	
Attribute 6	
Attribute 7	
Attribute 8	

Question 2

Matrix 1 (below) shows each of the efficiency attributes and strategies that were identified from the literature and interviews. The efficiency attributes are listed in the row and the strategies are listed in the column. Using a scale from 0 to 9 (shown below), where '0' indicates no relationship and '9' indicates a very strong relationship, please complete the relationship matrix to show how each strategy relates to each efficiency attribute.

Scale

0	1	3	5	7	9
No relation	Very weak	Weak	Moderate	Strong	Very strong

Matrix 1: Efficiency attributes and strategies

Strategies (S) / attributes (a)	S1 = Improving yield management	S2 = Customisable system in terms of payments and terms of trade	S3 = Using data analytics to add value	S4 = Target marketing	S5 = Transactional platform	S6 = Global distribution	S7 = Workflow automation	S8 = Pay on performance business model	S9 = Technological R&D	S10 = Ensuring security
a1 = Asset utilisation	a1S1									
a2 = Maximise revenue										
a3 = Access to more uses										
a4 = Save time										
a5 = Save costs										
a6 = Ease of doing business										
a7 = Ease of payment										
a8 = Secure system										

Question 3

Matrix 2 (below) is designed to show the relationship between the strategies. Using a scale from 0 to 9, (shown below), where ‘0’ indicates no relationship and ‘9’ indicates a very strong relationship, please complete the relationship matrix to show the extent of the relationship between the strategies.

Scale

0	1	3	5	7	9
No relation	Very weak	Weak	Moderate	Strong	Very strong

Note: You do not need to complete the shaded cells.

Matrix 2: Interrelationships between the strategies

Strategies (S) / Strategies (S)	S1 = Improving yield management	S2 = Customisable system in terms of payments and terms of trade	S3 = Using data analytics to add value	S4 = Target marketing	S5 = Transactional platform	S6 = Global distribution	S7 = Workflow automation	S8 = Pay on performance business model	S9 = Technological R&D	S10 = Ensuring security
S1 =Yield management										
S2 = Customisable system										
S3 = Using data analytics										
S4 = Target marketing										
S5 = Transactional platform										
S6 = Global distribution										
S7 = Workflow automation										
S8 = Pay on performance business model										
S9 = Technological R&D										
S10 = Ensuring security										

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