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A Multi-Stakeholder Delphi Study to Determine Key Space Management Components for Elderly Facilities in China

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Abstract: The elderly population in China is increasing rapidly. To meet elderly residents' housing demand, Chinese government makes great efforts to build more elderly facilities. However, major challenges in the operation of these elderly facilities, such as low space utilization rate, poor accessibility, poor environment and so on, have being emerging. The critical reason for challenges can be concluded as the lack of effective space management components. Therefore, the primary aim of this study was to explore key space management components for China's elderly facilities. Considering stakeholders' (facility owner, facility manager, care staff, elderly residents, and academic researchers) viewpoints on space management, this study used a multi-stakeholder Delphi approach to determine key space management components through five steps. Based on the selection criteria, a total of 25 Delphi panellists with five stakeholder groups were invited and finally 23 Delphi panellists participated in the whole study process. Subsequently, the academic researchers among these panellists were employed to quantify the stakeholders' influence with the parameter of stakeholder influencing factor. After that, the initial discussion on space management was performed to generate the initial list involving 11 space management components. Next, two ranking rounds were conducted to conclude the final significance scores of each space management component from five stakeholder groups' feedbacks. With respect to the final ranking score and the values of influencing stakeholder factor, the decision score of each space management components was calculated, which integrated all stakeholder groups' opinions. Finally, through two cut-off points, a total of seven components were selected as the key space management components for China's elderly facilities including space planning and assignment, space utilization audit, space occupancy cost audit, space inventory management, space usability management, space change management, and the management of health safety and environment. These components will assist facility managers to conduct effective and sustainable space management practice for supporting organizational core business.

Keywords: space management components; stakeholder; Delphi; post occupancy evaluation; elderly facilities; China

1. Introduction

There are over 230,860,000 people aged $\geq$ 60 in China, comprising about 16.7% of the population in 2016 [1]. The proportion of the population aged $\geq$ 60 in China is expected to increase to around 30% in 2040 and then to 42% in 2100 [2]. As a result, there will be an increased need for elderly care

in China. Several measures are now being implemented to meet the increasing need for elderly care including providing more elderly facilities, encouraging home care with subsidy, and so on. However, the recent report states that the vacancy rate of beds in elderly facilities in China is approximately 60.8% [3]; poor living environment and space dysfunctionality problems are discovered in existing elderly facilities [4,5]. These issues illustrate that the supply efficiency of elderly care in China is low which can result in the waste of space resource and the dissatisfaction of elderly residents. On the supply front, sustainable space management can be considered as an effective tool to reduce the cost of wasted space, optimize the use of space and improve occupational health and safety [6–8]. Therefore, it is imperative to conduct space management in elderly facilities in China to resolve those problems and to promote sustainable building operation.

Space management is an important part of facility management functions, which have been practiced in various facilities. Ibrahim et al. [7] proposed that the space charging model could be used for effective space management in higher education institutions; Hassanain and Moied [6] developed a process model to implement space assignment and space utilization audit in corporate organizations; and Steiner [9] claimed planning flexible workplace as an art of space management in commercial facilities. Most prior studies about space management have only focused on the space planning process and the evaluation of space utilization [6,7] while comprehensive research on exploring space management components remains rare, especially research that seeks to understand the perspectives of stakeholders which can be applicable to China's elderly facilities. The integration of comprehensive space management components, based on the perspective of stakeholders, forms a starting point for implementing sustainable space management practice. Considering these issues, the purpose of this research is to investigate and explore space management components in elderly facilities in China using a multi-stakeholder Delphi approach.

The remainder of this paper is organized as follows. Section 2 defines and discusses the concept of space management. Section 3 presents potential space management components that are explored from prior studies by literature review and then reviews the stakeholder theory in the field of facility management and space management. Section 4 describes the multi-stakeholder Delphi research procedure with five steps. Section 5 presents the results of Delphi research, and discusses the stakeholders' different viewpoints on space management components. Section 6 provides conclusive remarks and recommendations for future study.

2. Space Management Concept

It is widely accepted that space management is a fundamental part of facility management [10,11]. Prior studies proposed various definitions for space management in different industries, as shown in Table 1. This illustrates that space management does not yet have a commonly accepted definition. Traditionally, the process of space management was referred to delivering space service and managing the completed space plan, which was a tactical level issue responding to facilities strategy planning [12]. In addition, space management was summarized as interior design and space utilization evaluation [13,14]. However, several changes were apparent in recent definitions of space management. Several researchers stated that space management practice should link space with users and support core business goals [15,16]. In accordance with the strategic facility planning, the recent space management definition further explained the added value of space management to organizational business. Based on aforementioned discussion, this paper adopts the definition of space management presented by Li et al. [17], where they view space management as an interdisciplinary endeavor that incorporates space, users, activities and technologies to plan and manage a working/living environment that effectively support core business goals. It is noted that core business goals in elderly facilities include elderly residents' satisfaction, revenue growth, profitability growth, etc. [17].

Table 1. Definition of space management in different industries.

Industry Type	Researchers	Space Management Definition
Educational Institutions	SMG [18]	Effective space management means using benchmarking tool to evaluate space utilization, calculating space cost, assessing space needs, and managing space change.
	WFU [19]	Facilities planning and space management is a decision making process to provide and manage adequate space for all campus units.
	Ibrahim et al. [20]	Space management can increase occupancy of space, reduce costs, and ensure accurate information for space planning.
Hospitals	Sliteen et al. [21]	Space utilization relates to operation and maintenance costs in healthcare facilities.
	Moatari-Kazerouni et al. [22]	Optimizing space layout for means increasing the efficiency of hospitals and improving occupational health and safety.
Workplaces	ARCHIBUS [23]	Space management is to manage space effectively to reduce the cost of wasted space and optimize use of space.
	Best et al. [12]	Space management means delivering space service and managing the completed space plan.
	Ilozor et al. [24]	Space management is the practice of coordinating space with the people and organization.
	Blackstad and Torsvoll [25]	Space management is using space to support the core businesses and their performance, and using spatial resource efficiently.
	Jervis and Mawson [15]	Space management is the management of space to design economical and effective workplace experiences and then to support business objectives and workers' productivity.
Residential Buildings	Hui [26]	Building management works are initiated to satisfy tenant requirements, optimize space utilization, and improve security, health and safety.
Elderly Facilities	Leung et al. [16]	Space management is considered as a multiple discipline to integrate the planning and the management to achieve corporate goals and objectives in residential care homes.
	Li et al. [17]	Space management is an interdisciplinary endeavour that incorporates space, users, activities and technologies to plan and manage a working/living environment that effectively support core business goals.

3. Literature Review

3.1. Space Management Components

As a subset of facility management functions, effective space management is a critical competency and a major source of value optimization [6]. Regarding the elderly facility in China, the primary issue to conduct space management is to figure out what management components should be included in space management process. In other words, what kind of work should be done in space management practice? Most studies concentrated on the development of space management process for educational facilities and workplaces [6,27], while research on the space management for elderly facilities remains rare, especially research that seeks to list comprehensive management components upon space management. To make sense this issue, this paper aims to investigate the key space management components of elderly facilities in China. In this context, space management components are defined as the work and work processes in space management practice [28].

In recent years, more and more studies were conducted on the topic of space management process in various facilities. For instance, Space Management Group [18] implemented space management

project in UK higher education facilities, in which space utilization data and space charging tool were used to assess future space needs and plan space. Wake Forest University [19] developed the university's space management process with five functions including space inventory, space audit, space utilization audit, space assignment and capital planning. Gibson [29] stated that improved customer satisfaction and job productivity should be well concerned in the hospital planning and design. A workplace management process including comprising allocating area and planning workplace was proposed in the field of workplace management [25]. In the creation of key performance indicators for facility management performance assessment, Hinks and McNay [30] concerned the functional attainment of space and the space efficiency aspects which were illustrated in the indicators of space dimension: effective allocation of space, effectiveness of space utilization, space meets business needs and effective space planning. In general, the route to obtain the aforementioned performance data in space dimension is auditing space utilization and evaluation space functionality. In elderly facilities, such as assisted living facilities, the improvement of space functionality and space accessibility were associated with environment effectiveness which could directly enhance elderly residents' satisfaction [31,32].

Based on aforementioned various processes and functions, this paper developed a conceptual model for space management components in elderly facilities (Figure 1). Five work processes, space planning and assignment, space inventory management, space change management, HSE management, and space measurement management, are combined to develop the conceptual model of space management components for elderly facilities. All these work processes are being done with a critical physical item, namely "space".

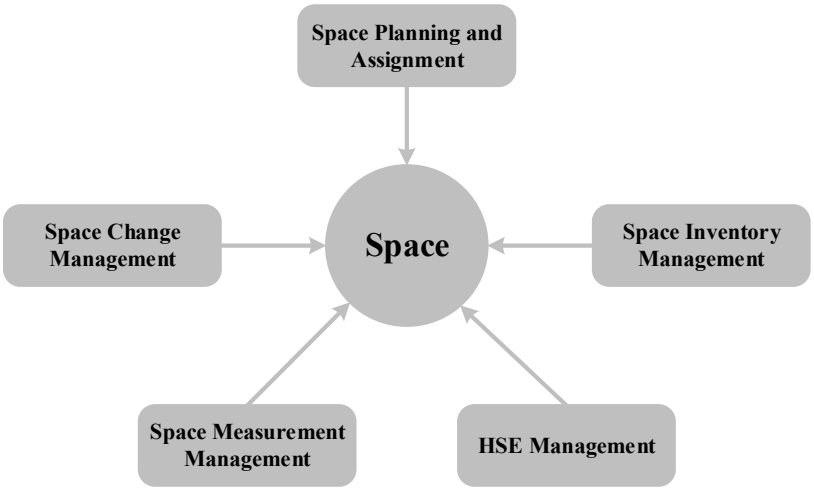

Figure 1. The conceptual model of space management components in elderly facilities.

Based on the conceptual model in Figure 1, peer reviewed studies that dealt with space management contents were adopted to perform a comprehensive literature review process, which resulted in an initial list of space management components in elderly facilities. To ensure reliability, the initial list was then checked and confirmed by co-researchers. Finally, a summary of 11 space management components for elderly facilities are presented in Table 2, in which the explanation of each components, corresponding applied fields and the related references are also illustrated. Specifically, the work process of space measurement management is a large concept that includes a variety of management components. To make clear this work process, this paper divides the work process of space measurement management into seven potential space management components (see Table 2) such as space utilization audit, space occupancy cost audit, etc.

Table 2. Potential space management components explored from literature reviews.

Space Related Work Processes	Potential Space Management Components	Explanations	Applied Fields	References
Space planning and assignment	Space planning and assignment	Space planning and assignment relates to redesigning layout of existing buildings and assigning available spaces to users.	Educational facilities; Hospitals; Workplaces; Elderly facilities.	[18,19,27]
Space inventory management	Space inventory management	All space data has to be stored in the space-inventory system which acted as the database.	Educational facilities; Workplaces.	[6,19]
Space change management	Space change management	Managing space change means move management, which requires predicting future space use, choosing move types, and charging space move cost simultaneously.	Educational facilities; Workplaces.	[18,30]
HSE management	HSE management	HSE management refers to the management of health, safety and environment, such as ensuring good ventilation and indoor air quality, comfortable lighting, safety layout, clean environment, and noise control, etc. (those work normally done concurrently with other space management work).	Educational facilities; Hospitals; Workplaces; Elderly facilities.	[17,26,33]
Space measurement management	Space utilization audit	Space utilization audit refers to measuring whether and how space is being used. The space utilization rate is the function of the frequency rate and occupancy rate.	Educational facilities; Hospitals; Workplaces; Elderly facilities.	[21,29,34]
	Space occupancy cost audit	Auditing space occupancy cost is a method in which many organizations internally bill departments for the space that they occupy as well as their share of floor or building common space.	Educational facilities; Hospitals; Workplaces.	[7,21,23]
	Users' space satisfaction management	Using post-occupancy evaluation (POE) to evaluate end-users' experience about space layout, environment quality and supportive facilities and then improve that.	Educational facilities; Hospitals; Workplaces; Elderly facilities.	[25,31,35]
	Staff productivity improvement	Using some measures, such as actual labour productivity, perceived productivity, absenteeism due to illness and so on, to evaluate and improve staff productivity among working environment.	Hospitals; Workplaces.	[24,36]
	Space functionality management	Space functionality management means checking and ensuring the space has the desired function.	Educational facilities; Hospitals; Workplaces; Elderly facilities.	[31,37,38]
	Space accessibility management	Involves the management of person-environment interaction that includes barrier-free environment, alternative orientation systems, and efficient work flows and logistics.	Hospitals; Workplaces; Elderly facilities.	[31,39,40]
	Space flexibility management	This aspect requires the building to accommodate frequent alteration, renovation and multiple use quickly and economically.	Educational facilities; Workplaces.	[41,42]

3.2. Stakeholder Theory

The stakeholder concept has been widely accepted since Freeman [43] defined the stakeholder as "any group or individual who can affect, or is affected by, the achievement of the organization's purpose". This concept is currently being more concerned with facility management. Jensen [44] developed a conceptual framework to explain the added value of facility management to core business, and the benefits for stakeholders including owners, staff, customers and society. After that, Tinsfeldt and Jensen [10] studied the value adding space management in higher education, in which the building end users, such as teachers and students, were selected as primary stakeholders to show their viewpoints on the value of space optimization. In addition, Coenen et al. [45] stated that the appraisal of value in facility management depended on the opinions of stakeholders who benefit from the value and who bare the burdens. Specifically, Leung et al. [16] investigated the key facility management components in residential care homes by studying the relationships between facility management components and the satisfaction of end-users including elderly residents and staff.

Based on aforementioned studies, it could be concluded that the value of space management in elderly facilities should be determined by stakeholders who may affect, or be affected throughout the space management practice. Further, it is noted that the objective of selecting key space management components is to ensure that the process of space management goes well and then can produce added value with efficiency and effectiveness. Regarding these two perspectives or relationships, it will be more effective to determine space management components directly by stakeholders. As a result, in this paper, five stakeholder groups related to space management in elderly facilities in China are identified, which comprises: (i) facility owner (that initiate space management work, finance it, and benefit from its outputs); (ii) facility manager (that operate space management practices); (iii) care staff (that working in space and receiving facility services); (iv) elderly residents (that living in space and receiving facility services); and (v) academic researchers (that providing strategies for space management and acting as facilitators). Both the care staff and elderly residents are end users who directly perceive and utilize space services and provision. From the demand perspective, the viewpoints of end users should be included in determining space management components in elderly facilities in China.

4. Research Methodology

Since literature review is relatively thin compared to the practitioners' rich experience and the stakeholders' requirements in implementing space management, it would be sensible to identify major space management components by listening to experts or stakeholders from business [46]. For this type of exploratory research, a multi-stakeholder Delphi study is an appropriate research methodology [47]. Specifically, Delphi is a research tool for structuring a group communication process to gather expert opinions in areas where there is uncertainty or a lack of knowledge [30]; Delphi panellists in this study should cover multi-stakeholder roles who are engaged in or affected by space management practice in elderly facilities in China. The literature review on stakeholder theory in facility management also illustrates the multi-stakeholder roles in this paper comprise facility owners, facility managers, care staff, elderly residents and academic researchers.

The multi-stakeholder Delphi study is implemented through five steps (Figure 2) including selecting Delphi panellists, quantifying stakeholders' influence, generating space management components for elderly facilities, ranking space management components, and selecting key space management components for elderly facilities in China.

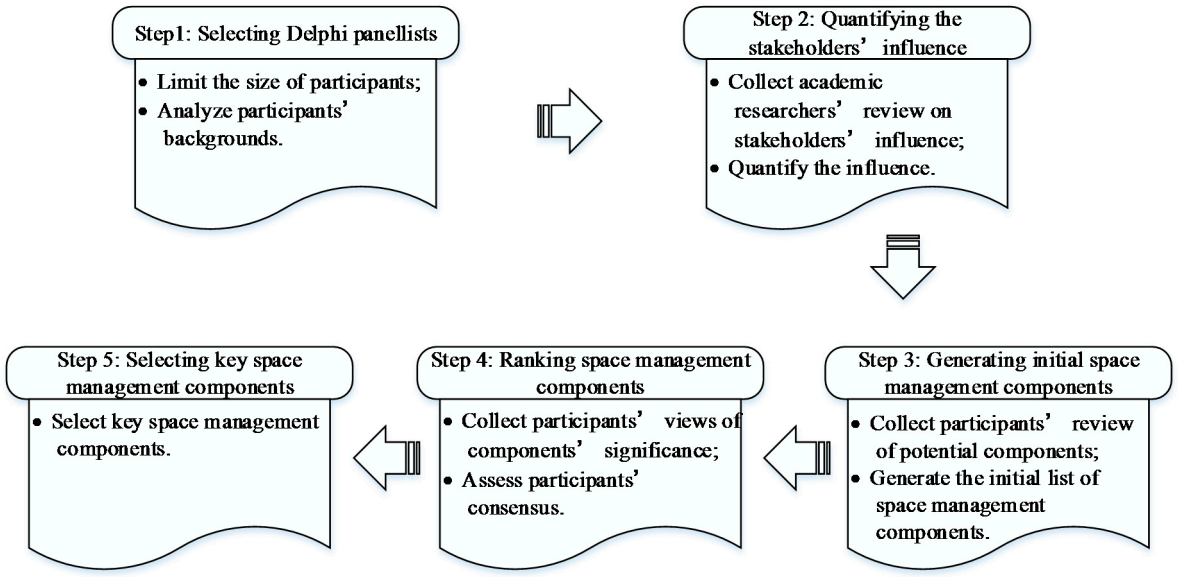

Figure 2. The process of multi-stakeholder Delphi research.

4.1. Step 1: Procedure for Selecting Delphi Panellists

Following the characteristic of the Delphi study, not depending on the statistical sample that attempts to be representative of any population, the group size of at least 20 participants is acceptable to obtain reliable outcomes [46]. In this study, another prerequisite to implement multi-stakeholder Delphi approach is the requirement of qualified experts or stakeholders who have deep understanding of space management practices and issues. Based on aforementioned concerns, this study develops the criteria to select Delphi panellists for each stakeholder group (Table 3).

Table 3. Selection criteria of Delphi panellists.

Stakeholder Groups	Minimum Requirement for Selection
Facility owners	• At least five years of professional experience in elderly care industry; • At least two years of experience to manage and operate elderly facilities in China.
Facility managers	• At least five years of professional experience in facility management practice; • Having the experience of facility management in elderly facilities in China.
Care staff	• At least five years of professional experience in elderly care service in China.
Elderly residents	• Living in an elderly facility at least one year in China; • Having the ability to communicate with interviewers.
Academic researchers	• At least five years of research experience in facility management and space management; • Primary or second writer of at least four peer-reviewed journal articles on the topic of facility management or space management.

According to the selection criteria, this study selects 25 Delphi panellists categorised into five groups: facility owners, facility managers, care staff, elderly residents and academic researchers. The demographics information of these selected Delphi panellists is shown in Table 4.

Table 4. Demographic information of the selected Delphi panellists.

Demographic Information		Panellists Amount
Stakeholder groups	Facility owner	5
	Facility manager	7
	Care staff	5
	Elderly residents	3
	Academic researcher	5
Experience years	1 year or less	2
	2–5 years	1
	6–10 years	19
	More than 10 years	3
Type of elderly facilities being involved in	Assisted living facilities	8
	Nursing homes	21
	Residential care homes	12
	Retirement communities	3
	Other	3

4.2. Step 2: Quantifying the Influence of Stakeholder Groups

Prior studies indicated that the conflict among stakeholder groups was inevitable as each stakeholder group had its own characteristic, values and behaviours that influenced its concerns on space management [17,48]. Therefore, more efforts should be made to balance the interests of all stakeholder groups for decision making related to space management components in elderly facilities. The primary issue is to accurately quantify the influence level of each stakeholder group, in which the concept of stakeholder influencing factor (*SIF*) is adopted [49,50]. This concept consists of two parts [51]: the stakeholder attribute value, *A*; and the vested interest-impact index, *ViII*. Stakeholder attribute value is determined by three factors: *P* (the stakeholders' power to influence), *L* (the legitimacy of stakeholder relationships), *U* (the urgency of the stakeholders' claim); the vested interest-impact index comprises two parameters: the vested interest level (v) and influence impact level (i). Table 5 details these parameters and the process of measuring *SIF*. Due to academic perspective having no preference, five academic researchers among the selected Delphi panellists are invited to assess the importance of *P*, *L*, *U* regarding determining space management components and determine the value of *P*, *L*, *U*, v and i for each stakeholder group based on the measuring measures in Table 5. The value of *SIF* of each stakeholder group is then normalized by the total value to make the sum of the normalized *SIF* equal to 1. Table 6 summarizes the results.

Table 5. Parameters of stakeholder influencing factor (*SIF*) in determining space management components.

Parameters	Explanations	Measures or Formulas
Stakeholder Influencing Factor (*SIF*)	*SIF* is used to quantify the stakeholder influence level for each stakeholder group in deciding space management components.	$SIF = A \times ViII$ (Equation (1))
Stakeholder Attribute Value (*A*)	Stakeholder attribute includes power (*P*), legitimacy (*L*) and urgency (*U*).	$A = P + L + U$ (Equation (2))
Power (*P*)	This describes the stakeholder's power to influence the space management practice in elderly facilities in China, which is quantified as 0 or 1/3.	An agreement is reached among academic researchers that the three elements of P, L, U are of equal importance. Therefore, the value of P, L, U of each stakeholder group are determined by following formulas: $P = \begin{cases} 1/3, & \text{having the power} \\ 0, & \text{not having the power} \end{cases}$ (Equation (3)); $L = \begin{cases} 1/3, & \text{stakeholder relationship is legitimate} \\ 0, & \text{stakeholder relationship is not legitimate} \end{cases}$ (Equation (4)); $U = \begin{cases} 1/3, & \text{stakeholder relationship is legitimate} \\ 0, & \text{stakeholder relationship is not legitimate} \end{cases}$ (Equation (5)).
Legitimacy (*L*)	This refers to the legitimacy of stakeholder relationships, which is quantified as 0 or 1/3.	
Urgency (*U*)	This represents the urgency of stakeholders' claim, which is quantified as 0 or 1/3.	
The vested interest-impact index (*ViII*)	*ViII* is determined by the vested interest level and the influence impact level.	$ViII = \sqrt{\frac{v \times i}{25}}$ (Equation (6))
Vested Interest Level (*v*)	*v* refers to the probability of stakeholder impact involved.	Both *v* and *i* of each stakeholder groups are measured on a scale of 1–5, where 1 denotes "very low" and 5 denotes "very high". Five academic researchers are also asked to rate *v* and *i* on a scale of 1–5. The mean value of *v*, *i* is used to measure *ViII*.
Influence Impact Level (*i*)	*i* refers to the level of stakeholder impact involved.	

Table 6. Influences of stakeholders groups in determining space management components in elderly facilities.

Stakeholder Groups	Attributes (*A*)			Stakeholder Attribute Value (*A*)	Mean Value of *v*	Mean Value of *i*	The Vested Interest-Impact Index (*ViII*)	The Stakeholder Influencing Factor (*SIF*)	Normalized *SIF*
	Power	Legitimacy	Urgency						
Facility owners	1/3	1/3	1/3	1	4.2	4.2	0.840	0.840	0.333
Facility managers	1/3	1/3	1/3	1	3.6	3.8	0.740	0.740	0.293
Care staff	N/A	1/3	1/3	2/3	2.2	1.8	0.398	0.265	0.105
Elderly residents	N/A	1/3	1/3	2/3	2.6	2.2	0.478	0.319	0.126
Academic researchers	N/A	1/3	1/3	2/3	2.8	2.6	0.540	0.360	0.143

4.3. Step 3: Generating Initial List of Space Management Components

The objective of this step is to generate the initial list of space management components for China's elderly facilities. To avoid confusions regarding terminologies, an explanation of space management concept and the list of potential space management components (Table 2) are firstly described in the email to these selected 25 Delphi panellists. Another two important questions, "which components in the list can be regarded as space management components for China's elderly facilities?" and "what are other necessary components you considered that should be added to the list of space management components?", are then attached in the email. The first question requires the panellists to select at least eight components from the listed 11 potential space management components; the second question is open and optional. One facility owner and one care staff pulled out in this round and thus a total of 23 panellists responded to this survey. According to the panellists' feedbacks, an initial list of space management components for China's elderly facilities will be generated by several adjustments such as combining components, adding new components, and so on.

4.4. Step 4: Ranking Space Management Components

In the fourth step, voting takes place over these selected space management components. These 23 Delphi panellists who responded to the third step would receive the second email. This email requires the panellists to provide their full opinions on the significance of space management components. The scale intervals are interpreted as follows: Can be ignored or not important (1 point); Maybe important (2 points); Important (3 points); Very important (4 points); and Most important (5 points). In this study, the Kendall's co-efficiency of concordance (W) is used to test the degree of consensus in each stakeholder group of Delphi panellists [52,53]. The ranking rounds stopped when either each stakeholder group reached moderate consensus (W > 0.5), or only slight changes of consensus occurred [53]. It is noted that the ranking rounds of each stakeholder group are conducted separately. When conducting the next ranking round if needed, the results of prior round and an interpretation of Kendall's co-efficiency of concordance (W) are also provided to Delphi panellists as additional information. The final ranking results will be used to select key space management components in Step 5.

4.5. Step 5: Determining Key Space Management Components

The critical advantage of multi-stakeholder Delphi approach is that viewpoints of all stakeholders can be balanced. To achieve that, the decision score (*DS*) of each space management component which will be used to select key components, is determined by the following formula:

$$DS = \sum_{j=1}^{5} Mean_j \times Normalized\ SIF_j \quad (7)$$

where *j* means the *jth* stakeholder group; *Mean* is mean value of the ranking scores in the last ranking round; and *Normalized SIF* is the normalized value of stakeholder influencing factor as shown in Table 6.

Key space management components in China's elderly facilities were selected using the following cut-off point: (a) a component decision score (*DS*) of 3.0 or higher on the importance rating; and (b) the component values of lower than 1 in the "standard deviation" of each stakeholder group in the final round. After selection with both rules, the final list of key space management components in China's elderly facilities were developed.

5. Results and Discussion

5.1. Influence of Different Stakeholder Groups in Determining Key Space Management Components

Five stakeholder groups of space management in elderly facilities in China, including facility owners, facility managers, care staff, elderly residents, and academic researchers, were invited as Delphi panellists to participate in determining key space management components for China's elderly facilities. After the selection of Delphi panellists, five academic researchers among these Delphi panellists were required to making the judgements upon the influence of different stakeholder groups based on the concept of stakeholder influencing factor (*SIF*). As a result, three rounds of discussion were carried out to reach an agreement on the parameters of stakeholder attribute value (A) and the vested interest-impact index (*ViII*).

The result of this judgement is summarized in Table 6. Facility owners have the highest mean values for both vested interest level (v = 4.2) and the influence impact levels (i = 4.2). The facility manager group enjoys the second highest mean values with v (3.6) and i (3.8). All these five academic researchers agreed that facility owners and facility managers possess power (P = 1/3), legitimacy (L = 1/3) and urgency (U = 1/3) in space management decisions, resulting in the attribute value of 1. Therefore, the normalized stakeholder influencing factor (*Normalized SIF* = 0.333) of facility owners is the greatest of all the stakeholder groups, followed by the facility manager group with 0.293 (*Normalized SIF*). The overwhelming majority of the academic researchers further confirmed the significant importance of facility owners and facility managers in the discussion rounds. In China, most elderly facilities are non-profit organizations with medium and small size. To reduce the human resource cost for maintaining bottom line profits, the majority of facility owners are responsible for operating and managing the elderly facility. Therefore, facility owners, who enjoy the highest power and pursue for obtaining the benefits of space management, would personally participate in space management practice and decision makings. This respect explains why facility owner have the highest stakeholder influencing value on space management. Besides, discussion results illustrated that the facility manager group took the space management work in practice and also they had the very professional experience on this work, which resulted in the higher value of stakeholder influencing factor.

In addition, the values of normalized stakeholder influencing factor in the groups of care staff, elderly residents and academic researchers are relatively low respectively with 0.105, 0.126 and 0.143. Academic researchers believe these three groups have no power to directly influence on space management in elderly facilities, leading to these groups' low value of A (2/3). As end-users of elderly facilities, the care staff group receives the lowest mean value of vested interest level (v = 2.2) and the lowest mean value of influence impact level (i = 1.8); the elderly residents gets the second lowest mean value of v (2.6) and i (2.2). This seems surprising since the concept users' satisfaction has been promoted in recent years, especially in the research field of facility management [16]. However, in the discussion on the selection of space management components, the care staff and elderly residents complained that they could have little impact on the space management decisions in practice. In China, elderly facilities pay more attention on the promotion of elderly care service rather than the end-users' experience on space aspect, especially the care providers' will for good workplace. Although the end users group having negligible impact on decision making, the academic researchers suggested that the end-users' input should be further emphasized in the space management decision mechanism to promote the post-occupancy evaluation process. The last stakeholder group, academic researchers, claimed their strong will to have a real influence on space management practices. However, they also pointed out that their claims may not be treated by elderly facilities as formal recommendations. Academic researchers suggested that the encouragement of space management research would urge facility owners and facility managers to develop space management practice in elderly facilities.

5.2. Space Management Components in China's Elderly Facilities

For the third step to generate the initial space management components, although most Delphi panellists made different selections, all these 11 potential space management components in Table 2 were marked with at least one vote. Through the content analysis on the voting results and the additional feedbacks (Table 7), the initial list of space management components for China's elderly facilities was generated (Table 8) including space planning and assignment (marked as C1), space utilization rate audit (marked as C2), space occupancy cost audit (marked as C3), space inventory management (marked as C4), users' space satisfaction management (marked as C5), space usability management (marked as C6), space change management (marked as C7), organization culture development (marked as C8), health safety and environment management (HSE management, marked as C9), and space strategy application (marked as C10). It was noted that the original component "staff productivity improvement" was removed due to its poor operability; space functionality management, space accessibility management and space flexibility management were integrated as space usability management; organization culture development and space strategy application were added to the initial list.

After two rounds of ranking on the space management components in the fourth step, 23 Delphi panellists reached an agreement. The facility owner group reached strong agreement (W = 0.774) after Round 1 and Round 2; the facility manager group had moderate agreement for the Round 1 and Round 2 (W > 0.50); the care staff group gave a moderate agreement with W = 0.639 after Round 2; the elderly resident group only require one round since its degree of consensus (W = 0.852) already reached strong in Round 1; the academic researcher reached strong agreement (W = 0.735) after two rounds. In other words, only the elderly resident group was required to rank for one round while the other groups were required to rank for two rounds. The results from two rounds of ranking along with their mean, standard deviation and the Kendall's co-efficiency of concordance were shown in Table 8.

With respect to the selection process in Step 5, seven space management components were chosen as key space management components for China's elderly facilities based on cut-off point rules. All of these initial 11 components received lower standard deviation (SD < 1.0) in each stakeholder groups, illustrating the achievement of agreement level upon significance rating. Among of them, the components of C5 (users' space satisfaction management), C8 (organization culture development) and C10 (space strategy application) were ranked with lower significance scores by majority Delphi panellists, resulting in their lower decision scores (see Table 8). Therefore, these three components with lower decision scores ($DS < 3.0$) were removed from the list of key space management components in elderly facilities in China.

This study further concludes the content of each space management component from literature review and Delphi panellists' viewpoints. It is not surprising that the component of HSE (health, safety and environment) management have the highest decision scores. Prior studies also proposed that providing a comfortable, safe and healthy physical environment is a very critical goal in the operation of elderly facilities [54]. Obviously, this goal can be achieved through HSE management which could directly enhance end-users' living satisfaction or working productivity [16,55]. Space planning and assignment (C1) receives the second highest decision score, which is one traditional part of space management work. In practice, the detail of this work includes linking space to core business, projecting space requirements, planning or re-planning the space configuration, assigning available spaces to end-users [56,57]. The decision score of space usability management (C6) is ranked in the highest three of the components. The concept of usability has emerged in recent years, largely in the built environment. In terms of the elderly facilities, space usability describes the attributes of physical environment regarding functionality, accessibility, flexibility and so on, which is applicable in the post occupancy evaluation of the built environment [31]. Most Delphi panellists claimed that the management of space usability in space management should be strengthened.

Table 7. Feedback summary from experts in the first round.

No.	Feedbacks	Number of Feedbacks from Experts				
		Facility Owners	Facility Managers	Care Staff	Elderly Residents	Academic Researchers
1	Space planning and assignment is the primary work in space management practice.	2	5	0	1	4
2	Space utilization rate and space occupancy cost can provide measureable indicators to evaluate existing space use and to predict space needs in future, which could help to deliver effective space management.	2	5	1	0	3
3	Space inventory is the database that contains floor plans, occupancy assignments, space utilization data, the occupancy cost information, etc. This database provides a wealth of information to facility managers or facility management staff to conduct general space management work. Therefore, developing and maintaining the space inventory is very important.	2	6	0	0	4
4	In practice, users' satisfaction rate is the very critical performance indicator to assess facility management department. Experience about space layout, environment quality and supportive facilities will directly influence residents' quality of life or influence the productivity of care staff. Focusing on ensuring the users' space satisfaction could support the core business of elderly facilities.	1	2	2	2	3
5	It is difficult to measure the staff productivity among working environment. For example, the percentage of time spent working productively or distraction time is difficult to calculate. In reality, facility managers can only manage and improve space functionality, space accessibility, environment quality and so on, while facility managers have no ability to directly control the staff productivity.	1	3	0	0	2
6	Space functionality, space accessibility and space flexibility all related to both function and use and are applicable in the post-occupancy evaluation (POE) process. To simplify the research scope, these three components can be integrated as one component named space usability. In addition, space functionality, space accessibility and space flexibility should also be pre-considered in space planning phase.	0	0	0	0	3
7	Change management is one of the trends in facility management field. In elderly facilities, moves happen quickly and correctly to avoid delays, to reduce residents' risk and reduce move cost have a significant impact on elderly care business. Besides, predicting future space needs timely and correctly also support organizational core business.	2	3	1	0	2
8	More and more strategies are concluded from space management practice such as sharing space, space chargeback, benchmarking, informatization tools (Integrated Workplace Management Systems, IWMS and Computer Aided Facility Management software packages, and CAFM) and so on. These strategies are being widely implemented in commercial workplaces and educational facilities. Therefore, applying space strategy may become an essential work in China's elderly facilities.	0	2	0	0	2
9	It is concluded that the best space management practice could enhance the business brand and strengthen the organizational culture development. This because the space is one of the medium for expressing organizational culture. Combining organizational culture development with space management may achieve a win-win result.	1	0	0	0	1

Table 8. Ranking of space management components for China's elderly facilities by Delphi panellists.

No.	Components	Facility Owner				Facility Manager				Care Staff				Elderly Resident				Academic Researcher				Decision Score	Chosen Components
		Round 2		Round 3		Round 2		Round 3		Round 2		Round 3		Round 2		Round 3		Round 2		Round 3			
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
C1	Space planning and assignment	4.250	0.500	4.250	0.500	3.571	0.535	3.571	0.535	2.750	0.500	2.750	0.500	3.333	0.577	3.333	0.577	4.400	0.548	4.400	0.548	3.799	√
C2	Space utilization audit	4.500	0.577	4.500	0.577	3.857	0.690	3.714	0.488	2.500	0.577	2.500	0.577	2.667	0.577	2.667	0.577	4.200	0.447	4.200	0.447	3.786	√
C3	Space occupancy cost audit	4.250	0.500	4.250	0.500	3.714	0.756	3.571	0.535	3.000	0.816	2.750	0.500	2.333	0.577	2.333	0.577	4.000	0.707	4.400	0.548	3.673	√
C4	Space inventory management	3.250	0.500	3.250	0.500	4.286	0.488	4.286	0.488	3.000	0.816	2.750	0.500	1.667	0.577	1.667	0.577	4.400	0.548	4.400	0.548	3.466	√
C5	Users' space satisfaction management	3.000	0.817	2.500	0.577	3.000	0.577	3.000	0.577	3.250	0.500	2.250	0.500	3.333	0.577	3.333	0.577	2.800	0.447	2.800	0.447	2.768	×
C6	Space usability management	3.500	0.577	3.500	0.577	3.571	0.787	4.000	0.577	3.750	0.500	3.750	0.500	4.333	0.577	4.333	0.577	3.600	0.894	3.400	0.548	3.790	√
C7	Space change management	3.500	0.577	3.250	0.500	3.571	0.787	3.429	0.535	3.000	0.816	2.750	0.500	2.667	0.577	2.667	0.577	3.800	0.837	3.600	0.548	3.227	√
C8	Organization culture development	2.250	0.500	2.500	0.500	2.143	0.690	2.286	0.488	2.000	0.816	1.750	0.500	2.333	0.577	2.333	0.577	3.000	0.707	2.800	0.447	2.630	×
C9	HSE management	4.500	0.577	4.750	0.500	4.143	0.690	4.286	0.488	3.750	0.957	3.750	0.500	4.333	0.577	4.333	0.577	3.400	0.548	3.400	0.548	4.263	√
C10	Space strategy application	2.250	0.500	2.250	0.500	2.429	0.535	2.429	0.535	3.000	0.816	2.250	0.500	1.333	0.577	1.333	0.577	2.800	0.837	2.600	0.548	2.237	×
	W	0.689		0.774		0.573		0.664		0.355		0.639		0.852		0.852		0.504		0.735		N/A	N/A

The audit of space utilization (C2) and space occupancy cost (C3) are recognized as classic space management work in modern integrated workplace management systems (IWMS) [23]. Delphi panellists' concern on these two components illustrates that classic space management practice is being widely promoted by stakeholders in elderly facilities. Space utilization management refers to gathering occupancy data for evaluate space utilization rate and optimizing space-use with strategies. In addition, space occupancy cost audit requires the organizations internally bill departments for the space they occupy. This practice also helps facility managers to understand the overall operational cost related to space and then to carry out strategies for reducing the operation cost of elderly facilities. Another component named space inventory management (C4) has been ranked at sixth position. However, in the framework of integrated workplace management systems, space inventory management is usually set in the first part of space management section. The space inventory management sector commonly includes the gathering and updating space hierarchy data, space layout and occupancy data, etc. In practical perspective, space inventory management should be paid more attention by facility owners and facility managers. Regarding space change management (C7), this work process is necessary since moves occurred frequently in elderly facilities due to organization growth, or individual movement. In addition, effective change management can have a significant impact on organization's business strategy and bottom line, in which the factors of cost, risk and reaction time should be noted.

In addition, after an informal communication with Delphi panellists who rated C5, C8 and C10 with lower scores, several reasons could be concluded below for explaining why these three components were removed. Regarding users' space satisfaction management (C5), this component is deleted since it has been involved in the management of C1, C2, C3, C6, C7 and C9. Although the organization culture development was being widely proposed in workplace management, few Delphi panellists noticed that space was the medium for expressing organizational culture and values in elderly facilities. This resulted in that the component of C8 had the second lowest decision score. For the application of space strategy (C10) such as benchmarking tools, gap analysis and technology tools, this is the tool for improving space management performance rather than the management components. It could be inferred that the majority space strategy were produced from the best practice of managing key space management components in elderly facilities. Besides, prior study on elderly facilities in China also pointed that informatization systems (IWMS) could not deliver efficiency to China's elderly facilities because the scale of most elderly facilities is small and medium with less than 300 beds [17].

5.3. Difference Views of Various Stakeholders upon Key Space Management Components in China's Elderly Facilities

Unlike the conventional prioritizing approach in most Delphi studies, this study applies the stakeholder influencing factor (*SIF*) to fully consider all major stakeholders' different opinions on the significance of space management components for China's elderly facilities. The overall consensus level of Delphi panellists in both ranking rounds is 0.296 (W) and 0.460 (W), respectively, illustrating the weak agreement among Delphi panellists. This further claims that every stakeholder's needs may be different or even conflicting and also explains why each stakeholder group performs the ranking process separately.

Figure 3 compares the mean values of significance score within each stakeholder group ($Mean_j$) and the decision score (*DS*) of key space management components in all groups, which clearly shows that the decision score integrate all stakeholders' benefits. It is worth noting that both the care staff and the elderly residents, as end users, have more concerns on the architecture aspects such as space usability management (C6) and HSE management (C9), while the management aspects such as space utilization audit (C2) and space inventory management (C4) are ignored by them. This is reasonable because only the influence of architecture aspects relating to space function and environment could be noticed directly by end users since they receive the space service directly, while the benefits of

management aspects are not experienced directly. Another point needs to be described is that the line of facility manager generally align with the line of decision score, and there is only one big gap regarding the component of space inventory management (C4). It can be discovered that the ignorance of space inventory management by facility owners results in this big gap. It is surprise that there are still some facility owners who do not notice the big significance of space inventory management. In reality, space inventory management is the basic work for the audit of space utilization (C2) and space occupancy cost (C3). In general, the financial aspects (e.g., space utilization and space occupancy cost) are prioritized by facility owners and facility managers, while the architecture aspects (space usability and environment management) are being more valued from end users' perspectives. Besides, the academic researchers prefer to the classic space management aspects such as C1, C2, C3 and C4. Their professional and theoretical knowledge on conventional space management scopes may force them to focus on these components.

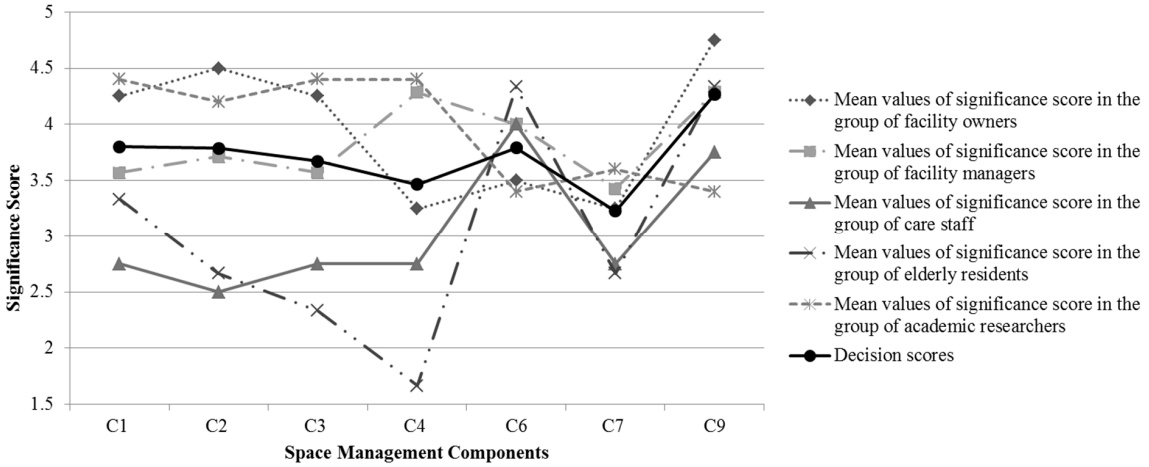

Figure 3. Comparison of different significances by different stakeholder groups.

6. Conclusions

Regarding space related problems, such as poor living environment and space dysfunctionality problems in China's elderly facilities, the practitioners lack a specified direction to implement space management work. One critical reason of this confusion is the lack of management focus, namely the absence of key space management components for the operation of China's elderly facilities. Starting from the review of space management concept, this paper shows how the application of a multi-stakeholder Delphi approach can lead to better understanding the key space management components for China's elderly facilities. Selecting and processing these key space management components is conductive to issue these space-related problems and to improve the building performance in a sustainable way.

A thorough literature review is performed to generate the list involving 11 potential space management components for elderly facilities. After that, a multi-stakeholder study comprising five steps is processed step by step. A total of 25 Delphi panellists are selected through the selection criteria, which are grouped into five stakeholders: facility owners, facility managers, care staff, elderly residents and academic researchers. With the assistance of the stakeholder influencing factor (*SIF*), all these stakeholders' influence on determining the space management components is quantified. An initial list of space management components with 10 aspects is generated based on the literature review results and Delphi panellists' discussion. Two ranking rounds are performed to conclude the significance of space management components among each stakeholder group, when the consensus of each stakeholder group achieves moderates level or high agreement level. With the final ranking results and the stakeholder influencing factor values, the decision score of each space management component is calculated. Finally, through the cut-off points for selecting key components, a total of

seven components are selected as the key space management components for China's elderly facilities: space planning and assignment (C1), space utilization audit (C2), space occupancy cost audit (C3), space inventory management (C4), space usability management (C6), space change management (C7), and health safety and environment management (HSE management, C9). It is also concluded that stakeholder groups have different opinions upon these space management components. As end users, care staff and elderly residents prefer to the architecture aspects; while other three stakeholders have more concerns on classic space management components related to financial aspects. The decision score of each space management component integrates all stakeholders' viewpoints, which could be provided for the practitioners to make decisions about how to assign limited resource to critical space management work as well as how to operate the elderly facilities in a sustainable way.

The seven key space management components offer a useful learning material for practitioners in the facility management of elderly facilities in China, and provide a sustainable direction for them to implement space management practice. Moreover, the influence of different stakeholders and their various views on space management contribute to helping the facility managers to balance the benefits of facility owner, care staff and elderly residents during the operation of elderly facilities in China. In view of the results, future studies should focus on developing a sustainable space management process with these key space management components for China's elderly facilities. To clearly model the performance of space management process, the resource needed for each space management components and their communications, such as duration time and duration cost, should be quantified and gathered in future work.

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References

1. National Bureau of Statistics of the People's Republic of China. Statistical Communiqué of the People's Republic of China on the 2014 National Economic and Social Development. Available online: http://www.stats.gov.cn/tjsj/ (accessed on 1 January 2017).
2. Lutz, W.; Sanderson, W.; Scherbov, S. The coming acceleration of global population ageing. *Nature* **2008**, *451*, 716–719. [CrossRef] [PubMed]
3. China Industry Information Center. China Institutional Care Facilities Supply Analysis. Available online: http://www.chyxx.com/industry/201605/420485.html (accessed on 1 August 2016).
4. Ding, H.; Xu, Y. Investigation on residents' living condition and satisfaction in society-run aged homes in beijing. *Soc. Sci. Bingjing* **2007**, *2007*, 15–20. (In Chinese)
5. Zhou, Y.; Chen, X. Empirical research and design suggestions of aged care facilities. *Archit. J.* **2014**, *2014*, 65–69. (In Chinese)
6. Hassanain, M.A.; Moied, M.A. A process modeling approach to space management in corporate organizations. *Built. Hum. Environ. Rev.* **2010**, *2010*, 49–59.
7. Ibrahim, I.; Yusoff, W.Z.W.; Bilal, K. Space charging model: As an effective space management tool in higher education institutions. *Adv. Manag. Appl. Econ.* **2012**, *2*, 163–179.
8. Moatari-Kazerouni, A.; Chinniah, Y.; Agard, B. Integrating occupational health and safety in facility layout planning, part i: Methodology. *Int. J. Prod. Res.* **2014**, *53*, 3243–3259. [CrossRef]
9. Steiner, J. The art of space management: Planning flexible workspaces for people. *J. Facil. Manag.* **2006**, *4*, 6–22. [CrossRef]

10. Tinsfeldt, M.; Jensen, P.A. Value adding space management in higher education. In Proceedings of the CIB 2014 Facilities Management Conference, Copenhagen, Denmark, 21–23 May 2014.
11. Yu, K.; Froese, T.; Grobler, F. A development framework for data models for computer-integrated facilities management. *Automat. Constr.* **2000**, *9*, 145–167. [CrossRef]
12. Best, R.; Langston, C.A.; Valence, G.D. *Workplace Strategies and Facilities Management*; Butterworth-Heinemann: Oxford, UK, 2003.
13. Quah, L.K. Facilities management, building maintenance and modernization link. *Build. Res. Inf.* **1992**, *20*, 229–232. [CrossRef]
14. Ilozor, B.D.; Oluwoye, J.O. Open-plan measures in the determination of facilities space management. *Facilities* **1999**, *17*, 237–245. [CrossRef]
15. Jervis, G.; Mawson, A. *The Workplace Management Framework Version 1*; Advanced Workplace Associates: London, UK, 2014.
16. Leung, M.Y.; Yu, J.; Dongyu, C.; Yuan, T. A case study exploring FM components for elderly in care and attention homes using post occupancy evaluation. *Facilities* **2014**, *32*, 685–708. [CrossRef]
17. Li, L.; Yuan, J.; Ning, Y.; Shao, Q.; Zhang, J. Exploring space management goals in institutional care facilities in china. *J. Healthc. Eng.* **2017**, *2017*. [CrossRef]
18. SMG. *Space Management Project: Summary*; Space Management Group: London, UK, 2006.
19. WFU. *Facilities Planning and Space Management Recommended Process and Procedures*; Wake Forest University: Winston-Salem, NC, USA, 2007.
20. Ibrahim, I.; Yusoff, W.Z.W.; Sidi, N.S.S. A comparative study on elements of space management in facilities management at higher eduaction institutions. In *2011 International Conference on Sociality and Economics Development*; IACSIT Press: Singapore, 2011; pp. 74–78.
21. Sliteen, S.; Boussabaine, H.; Catarina, O. Benchmarking operation and maintenance costs of french healthcare facilities. *J. Facil. Manag.* **2011**, *9*, 266–281. [CrossRef]
22. Moatari-Kazerouni, A.; Chinniah, Y.; Agard, B. Integration of occupational health and safety in the facility layout planning, part ii: Design of the kitchen of a hospital. *Int. J. Prod. Res.* **2014**, *53*, 3228–3242. [CrossRef]
23. ARCHIBUS Space Management: Decrease Occupancy Costs and Optimize Utilization Rates. Available online: https://www.archibus.com/index.cfm/pages.content_application/template_id/822/section/2009-03-26%2000:00:00.0/ (accessed on 1 June 2016).
24. Ilozor, B.D.; Ilozor, D.B. Open-planning concepts and effective facilities management of commercial buildings. *Eng. Constr. Archit. Manag.* **2006**, *13*, 396–412. [CrossRef]
25. Blakstad, S.H.; Torsvoll, M. Tools for improvements in workplace management. In Proceedings of the 9th EuroFM Research Symposium (EFMC2010), Madrid, Spain, 1–2 June 2010.
26. Hui, E.Y.Y. Key success factors of building management in large and dense residential estate. *Facilities* **2005**, *23*, 47–62. [CrossRef]
27. Ibrahim, I.; Yusoff, W.Z.W.; Bilal, K. Space management: A study on space usage level in higher education institutions. *Procedia Soc. Behav. Sci.* **2012**, *47*, 1880–1887. [CrossRef]
28. McGregor, W. The future of workplace management. *Faciities* **2000**, *18*, 138–143.
29. Gibson, I.W.; Lease, B.L. An approach to hospital planning and design using discrete event simulation. In Proceedings of the 39th Conference on Winter Simulation (WSC), Washington, DC, USA, 9–12 December 2007.
30. Hinks, J.; McNay, P. The creation of a management-by-variance tool for facilities management performance assessment. *Facilities* **1999**, *17*, 31–53. [CrossRef]
31. Andersson, M.; Lindahl, G.; Malmqvist, I. Use and usability of assisted living facilities for the elderly: An observation study in gothenburg sweden. *J. Hous. Elderly* **2011**, *25*, 380–400. [CrossRef]
32. Zimmerman, S.; Mitchell, C.M.; Chen, C.K.; Morgan, L.A.; Gruber-Baldini, A.L.; Sloane, P.D.; Eckert, J.K.; Munn, J. An observation of assisted living environments: Space use and behavior. *J. Gerontol. Soc. Work* **2007**, *49*, 185–203. [CrossRef] [PubMed]
33. Cutler, L.J. Physical environments of assisted living: Research needs and challenges. *Gerontologist* **2007**, *47*, 68–82. [CrossRef] [PubMed]
34. Hurwitz, J.E.; Lee, J.A.; Lopiano, K.K.; McKinley, S.A.; Keesling, J. A flexible simulation platform to quantify and manage emergency department crowding. *BMC Med. Inform. Decis. Mak.* **2014**, *14*, 50. [CrossRef] [PubMed]

35. Leung, M.-Y.; Yu, J.; Yu, S. Investigating key components of the facilities management of residential care and attention homes. *Faciities* **2012**, *30*, 611–629. [CrossRef]
36. Voordt, T.J.M.V.D. Productivity and employee satisfaction in flexible workplaces. *J. Corp. Real Estate* **2004**, *6*, 133–148. [CrossRef]
37. Wiggins, J.M. *Facilities Manager's Desk Reference*; Wiley-Blackwell: Hoboken, NJ, USA, 2014.
38. Blanchette, S. Space & power in the ivory tower: Effective space management and decision making-what's the problem and what's the process? *Plan. High. Educ.* **2010**, *41*, 64–73.
39. Talib, Y.; Rajagopalan, P.; Yang, R.J. Evaluation of building performance for strategic facilities management in healthcare: A case study of a public hospital in australia. *Facilities* **2013**, *31*, 681–701. [CrossRef]
40. Elias, B.M.; Cook, S.L. Exploring the connection between personal space and social participation. *J. Hous. Elderly* **2016**, *30*, 107–122. [CrossRef]
41. Lindholm, A.L. A constructive study on creating core business relevant crem strategy and performance measures. *Facilities* **2008**, *26*, 343–358. [CrossRef]
42. Bröchner, J. Integrated development of facilities design and services. *J. Perform. Constr. Facil.* **2003**, *17*, 19–23. [CrossRef]
43. Freeman, R.E. *Strategic Management: A Stakeholder Approach*; Pitman: Boston, MA, USA, 1984.
44. Jensen, P.A. The facilities management value map: A conceptual framework. *Facilities* **2010**, *28*, 175–188. [CrossRef]
45. Coenen, C.; Alexander, K.; Kok, H. Facility management value dimensions from a demand perspective. *J. Facil. Manag.* **2013**, *11*, 339–353. [CrossRef]
46. Akkermans, H.A.; Bogerd, P.; Yucesan, E.; van Wassenhove, L.N. The impact of erp on supply chain management: Exploratory findings from a european delphi study. *Eur. J. Oper. Res.* **2003**, *146*, 284–301. [CrossRef]
47. Zeeman, H.; Wright, C.J.; Hellyer, T. Developing design guidelines for inclusive housing: A multi-stakeholder approach using a delphi method. *J. Hous. Built. Environ.* **2016**, *4*, 761–772. [CrossRef]
48. Pennanen, A.; Whelton, M.; Ballard, G. Managing stakeholder expectations in facility management using workplace planning and commitment making techniques. *Facilities* **2005**, *23*, 542–557. [CrossRef]
49. Li, H.; Zhang, X.; Ng, S.T.; Skitmore, M. Quantifying stakeholder influence in decision/evaluations relating to sustainable construction in China—A Delphi approach. *J. Clean. Prod.* **2017**. [CrossRef]
50. Bourne, L.; Walker, D.H.T. Visualising and mapping stakeholder influence. *Manag. Decis.* **2005**, *43*, 649–660. [CrossRef]
51. Li, T.H.Y.; Thomas Ng, S.; Skitmore, M. Modeling multi-stakeholder multi-objective decisions during public participation in major infrastructure and construction projects: A decision rule approach. *J. Constr. Eng. Manag.* **2016**, *142*, 04015087. [CrossRef]
52. Iden, J.; Langeland, L. Setting the stage for a successful itil adoption: A delphi study of it experts in the norwegian armed forces. *Inf. Syst. Manag.* **2010**, *27*, 103–112. [CrossRef]
53. Gracht, H.A.V.D. Consensus measurement in delphi studies: Review and implications for future quality assurance. *Technol. Forecast. Soc. Chang.* **2012**, *79*, 1525–1536. [CrossRef]
54. Schalm, C. Implementing a balanced scorecard as a strategic management tool in a long-term care organization. *J. Health. Serv. Res. Policy* **2008**, *13*, 8–14. [CrossRef] [PubMed]
55. Morgan, A.; Anthony, S. Creating a high-performance workplace: A review of issues and opportunities. *J. Corp. Real. Estate* **2008**, *10*, 27–39. [CrossRef]
56. Roper, K.O.; Payant, R.P. *The Facility Management Handbook*, 4th ed.; AMACOM: New York, NY, USA, 2014; p. 688.
57. ARCHIBUS. Organizations Using Archibus. Available online: http://www.archibus.com/success-story-by-industry/section/Industry%20Success%20Stories/menuid/84 (accessed on 25 May 2017).