

Greenfield Shopping centre development. The integration between environmental features, building design and investment analysis at the decision making stage.

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Structured Abstract:

The Shopping centre is a long term investments in which Greenfield development decisions are often taken based on risks analysis regarding construction costs, location, competition, market and an "expected" DCF. Furthermore, integration between the building design, project planning, operational costs and investment analysis is not entirely considered by the investor at the decision making stage. The absence of such information tends to produce certain negative impacts on the future running costs and annual maintenance of the building, especially on energy demand and other occupancy expenses paid by the tenants to the landlord. From the investor's point of view, this blind spot in strategy development will possibly decrease their profit margin as changes in the occupancy expenses have a direct outcome on the profit margin.

In order to try to reduce some higher operating cost components such as energy use and other utility savings as well as their CO2 emissions, quite a few income properties worldwide have some type of environmental label such as BREEAM and LEED. The drawback identified in this labelling is that usually the investments required to get an ecolabel are high and the investor finds no direct evidence that it increases Market Value. However there is research on certified commercial properties (especially offices) that shows better performance in terms of occupancy rate and rental cost (see Warren-Myers, 2012 for a detailed discussion). Additionally, Sayce (2013) says that the certification only provides a quick reference point i.e. the lack of a certificate does not indicate that a building is not sustainable or efficient.

Based on the issues described above, this research compares important components of the development stages such as investments costs, concept/ strategy development as well as the current investor income and property value. The subjects for this analysis are a shopping centre designed with passive cooling/ bioclimatic strategies evaluated at the decision making stage, a certified regional shopping centre and a non-certified standard regional shopping centre. Moreover, the proposal intends to provide decision makers with some tools for linking green design features to the investment analysis in order to optimize the decision making process when looking into cost savings and design quality.

Keywords: shopping centre investment, green building, real estate development, passive strategies design, decision making

Article Classification: Real estate development

1. INTRODUCTION

Although the shopping centre is an American phenomenon, it has been perhaps the most successful real estate, land use and retail business concept worldwide on the 20th century. The industry development and its expansion overseas have transformed shopping habits, retail distribution systems, urban structures, as well as the land value surrounding the building (see White & Gray, 1996; Beyard & O' Mara, 1999 for more details). The modern centre is not only a retail space but also one of the most important community options for leisure activities and as a place to gather. It is a complex commercial establishment comprising a wide mix of tenants, among which there are daily services, health care and entertainment such as restaurants, movie theatres and children's play areas. The mixed arrangement works in conjunction with an attractive, comfortable spatial definition in order to enhance the shopping experience for those visiting the centre and also to inspire their decisions. This is one method developers and owners have been using to keep their centres competitive and to attract increasingly more consumers as well as marketing and selling merchandise, since the growing popularity of online shopping has been influencing traditional retailing.

According to Kramer et al. (2008), digital retailing and new customer behaviour have forced the industry to explore a new form of retail environment in which shopping spaces are more integrated and more oriented to customers' choices. Consequently, the centre is designed with greater flexibility for future changes and increases in uses and functions in line with retail market perspectives. From the investor's point of view, the centre now is a dynamic business as it is continually changing. Their strategies also entail linking up a series of socioeconomic, financial and design decisions, which should be taken at the early development stages.

Carrying the above issue further, the centre can be considered a restricted commercial property investment. It is a long term investment in buildings seldom able to change their use as their design features are particular to this sort of business. Moreover, development decisions are taken based on low-risk scenarios. As well as integration of building characteristics, expansion planning, operation and maintenance should be considered so that the building is capable of absorbing strategy changes. That is to say, this full analysis works in conjunction with the economic circumstances to guarantee an adequate revenue flow that makes sure the shopping centre is financially successful (Vernor et al., 2009).

Furthermore, the shopping centre development process operates a sequence of events, some of which overlap or repeat at different stages. Planning the centre moves beyond the conceptual stage once the investment feasibility is determined by the quantification of future expectations. This process is infinitely flexible and few activities follow a predictable sequence. In addition, developers' subjective experience drives the decision making instead of prescribed analysis or research on the field. Rational project planning is not advanced and this emphasises a lack of systematic reflection (Fisher & Collins, 1999).

According to Kohlhepp (2012), the conceptual models used to describe the real estate development lead to confusion, frustration, duplicity and extraordinary risk-taking as developers have a dissimilar understanding of the nature of the development process. Furthermore, integration of the development events is not completely considered at the decision making stage. The absence of such information tends to produce certain negative impacts on the future running costs and annual maintenance of the building, especially on energy demand and other occupancy expenses paid by the tenants to the landlord. From the investor's point of view, this blind spot in strategy development can potentially decrease their profit margin as changes in the occupancy expenses have a direct influence on profit margin.

In order to explain the real estate process and to develop management and decision support models of practical use, many academic researchers have concentrated on development process arrangement providing a framework of activities although it has little empirical evidence due to the lack of professional uses. However, much is written concerning the development stages but quite little in view of the importance of their integration when making decisions. Another topic of note is that software for real estate development is underdeveloped and investors merely deal with financial appraisal packages used to analyse the



expected cash flow, although this gives insufficient information to assist them at decisions or risk management through the process.

In parallel with the issue above, since the subject of sustainability has become prominent in the real estate sector, many researchers have been focusing on connecting environmental aspects to commercial property development and valuation. However, developing and assessing a green building is not yet an exact science. According to Sayce et al. (2013), as there is no one sustainable building definition and the stakeholders have different perception about this concept. Creating value from these criteria is a complex and subjective activity that requires valuers and investors to have a deep understanding and to keep abreast of developments in the area. In order to achieve a sustainable identity, developers and owners worldwide are increasingly seeking to certify their buildings using some type of environmental label e.g. BREEAM and LEED. However, the certification only provides a quick reference point i.e. the lack of a certificate does not indicate that a building is not sustainable or efficient.

In addition, the drawback identified in this type of labelling in commercial properties is that usually the investments required to get a sustainability certificate are high and the investor finds no direct evidence that it increases Market Value. As the objective of an investment is to maximise the return on capital based on economic theory, raising the use of sustainable criteria in commercial property development is limited due to the lack of financial justification and empirical evidence. However, there is research on certified commercial properties (especially offices) that shows better performance in terms of occupancy rate and rental cost although specifically on shopping centre investment there is very little research which clearly proves that it is possible to obtain a better certificate rating with relatively low financial investment (see Warren-Myers, 2012 for more details).

Looking into the connection between development process and sustainability, although some criteria can decrease running costs, construction costs, maintenance and depreciation of the building, the shopping centre's conceptual designers frequently dismiss the importance of integration between environmental and building performance. Furthermore, many investors and developers worldwide suppose that sustainable building is primarily featured by restricted parameters such as energy demand and waste of water. Topics such as human health and well-being, protecting the natural environment and resources as well as recycling materials are usually not considered in decision-making. According to Kohlhepp (2012), green building techniques and sustainable development are best understood in the building life cycle context instead of at the construction stage. However, today the most important analysis of the sustainable nature of a development is purely made at the local government approval stage prior to the construction stage.

The aim of this paper is to understand, from a practical perspective, how environmental and sustainable features are capable of influencing the shopping centre development decisions considering the changes in the sector. Moreover, the proposal intends to provide decision makers with some tools for linking green design features to the investment analysis in order to optimize the decision making process when looking into cost savings and design quality. To achieve these goals, the study compares important components of the development stages in which the building's physical quality interferes in the decision-making.

The subjects for this analysis are three shopping centres with different design aspects and owned by International level companies. Although the centre business model is International (White & Gray, 1996), some circumstance alter in each case due to local marketability. To delimit the research, the Brazilian market was chosen for two main factors: [i] in recent years the sector has been showing a large number of Greenfield developments as a result of higher company capitalization caused by the offer of shares on the stock market as well as foreign company investments in the domestic market; [ii] according to ICSC¹ data, although the Brazilian market presents an enormous number of gross leasable area (GLA), when comparing the total Brazilian GLA per inhabitant to the USA, UK and Canada in which the sector is more developed, the Brazilian market shows a high potential for new developments.

¹ The International Council of Shopping Centers (ICSC) is the global trade association of the shopping center industry.





In the next section, previous research on the real estate development process and Building sustainable features is presented and their relationship to shopping centre development is discussed. After that, the case study and results are presented, followed by the conclusions and recommendations.

2. THE DEVELOPMENT PROCESS

In summary, a real estate development process is a sequence of linked activities, in which the first stage is the business opportunity identification and the last is the occupation of the building by the users after the construction is complete (see Fisher & Collins, 1999; Wyatt, 2006; Costello & Preller, 2010; Kohlhepp, 2012 for more details). Although this field is a significant economic output component for many countries, it should be noted that there is still very little research and literature worldwide and what there is is focused on discussing the development events individually such as project feasibility, planning and design, as well as building operation. However, research does not provide sufficient information about the integration and sequence in making these decisions. Furthermore, usually subjective experience drives the decision making and the process management due to the lack of a planning methodology and a systematic reflexion that provides an entirely view of the development.

According to Graaskamp (1981), the process involves different personalities, interest groups, as well as limited resources, i.e. it is a complex business with constant interaction of three main groups – consumers, stakeholders, and public infrastructures such as offsite services and facilities. Hence the developer requires a holistic framework that provides an in-depth examination of risks and opportunities at the investment analysis decision stage, as well as potentially avoiding time and cost failures at the management process stage. The process is a larger system that encompasses a considerable number of stakeholders to achieve long term objectives, thus it is not only important to understand working processes but as well to be conscious of the factors that influence the firm strategies and the process in itself (see Wyatt, 2006; Kohlhepp, 2012, for more details).

Moreover, it is important to highlight that the shopping centre is a dynamic business, as the design is often changed in order to make the stores spaces suitable for tenants' needs. Therefore, it is essential that developers should understand development stage integration in order to measure its impact on time and costs and quantify these modifications in the investment analysis as well.

Regarding the process stages, according to Kohlhepp (2012), most texts divided the real estate development process into four broad steps: site acquisition, obtaining necessary approvals, building construction, lease-up and operation of the building. On the other hand, Wyatt (2006) states that the process has five stages: opportunity – feasibility – design – production – occupation, as well as the fact that it is cyclical, in that redevelopment takes place through real estate asset depreciation.

However, with the current urban growth pattern, which deals with land recycling and Greenfield land development, in order to reflect a long term view of the process, Kohlhepp (2012) highlights the necessity to expand the models with three more stages: [i] The Land package stage, in which a land planning firm improves the value of the land through conceptual land planning, zoning changes and environmental study before selling the land to the land developer; [ii] The land development stage in which the land developer builds roads, utilities, recreational amenities as well as the land subdivision; [iii] The renovation stage where the depreciated property is remodelled and then repositioned in the market.

Looking into Greenfield shopping centre development, understanding the activities included in the Land package and land development stages is essential when the business analysis embarks on the acquisition of a site for which the master plan is still under development. The new urbanization and its features such as approval time, zoning, mixed uses and site occupation, impact directly on the investors' strategies and also on the Shopping Centre Market Positioning and Expansion.



2.1. The development stages

Step 1 – site selection

According to Wilkinson & Reed (2008), the development starts when either a parcel of land or a site is considered suitable for the proposed use, or if the demand for a particular use leads to a search for a suitable site i.e. the development idea comes from an early study of a site or metropolitan area where a possible demand or need for the real estate use is identified. This market analysis encompasses demographic, socioeconomic, financial and merchandising information, which helps the developer to identify an opportunity or potential planning according to their entrepreneurial vision.

The land choice for the development of any type of centre should involve the analysis of important features such as: trade area distance, location for target markets, easy access, high visibility and proper size, shape and topography for the centre proposed and its parking. The site should also be located in an area with a potential for population and economic growth. Furthermore, Kramer et al (2008) highlights that the optimal location is vital to the success of the centre and the absence of any of these factors will possibly negatively impact business feasibility.

Step 2 – project feasibility

This stage is considered one of the most important phases of the development process. It is divided into important analysis, which provides key information for the developer to take the decision to invest in the project or not. In other words, the viability analysis explores in depth four main issues: 1. market research; 2. site physical features and zoning, 3. legal investigations; 4. the financial appraisal of the centre.

The first issue, Market analysis, could be considered the backbone of the project's feasibility as it deals with the identification and study of demand and supply for the proposal. It provides the input for analysing retail opportunities and selecting target markets improves the initial business concept and also stimulates development ideas (Kramer, 2008). Furthermore, it supplies the developer with trade economic information that aids them in determining the minimum rents and the tenant mix of the centre and also to avoiding market risks. Therefore, a comprehensive market study for retail encompasses: geographic delineation of the trade areas, population characteristics, competitive retail characteristics (such as annual sales and tenant mix), as well as recommend characteristics for the centre such as size, tenant mix and anchors. It is important to note that the conceptual design of the centre, interior characteristics and spatial dimensions are mainly driven by the market research (see White & Gray, 1996; Beyard & O' Mara, 1999; Kramer et al, 2008 for more details).

The feasibility analysis of the land includes analysis of location and physical features, which impact directly on the investment costs. Furthermore, it is one of the main topics that interferes in the acquisition of the land and its purchase price. To put it in a nutshell, this analysis involves professionals such as engineers, urban planners, and lawyers in order to evaluate the site suitability. Frequently, an assessment is made of the soil conditions, utilities and existing infrastructure (e.g. electricity, water, gas and telephone), local accessibility, surrounding uses and zoning. It is important to note that this analysis drives the design concept and the construction cost of the building that will be used in the financial appraisal. The absence of any information concerning site characteristics, local government permissions process and construction costs can distort the investment time and cost flow, negatively influencing the business analysis.

Unless the developer is the landlord, all legal issues about the land should be evaluated. The legal investigation includes ownership, existing planning permissions, and any rights of way. Any error in establishing the extent of ownership, in terms of cost or time, in acquiring the land will critically affect the viability of the development. The legal team assess which matters will be necessary to acquire the land and which sort of risks are involved in the transaction (Wilkinson & Reed 2008).

The financial viability assess whether a project is profitable or not. To be more specific, measuring project return analyse whether the hypothetical centre is capable of generating sufficient income to cover the investment cost and to produce a sufficient return expected by the investors as well. It is the major factor

that effects each decision making stage of the development process, from the land acquisition to the detailed operations of the centre. Throughout the whole development process, the investor will be measuring the impact of their decisions on the investment analysis.

At this time, the development team focus their attention on a particular cost spread over a particular time. The previous analysis of the market, site and conditions acquisition drives numerical information, which will be imputed in the financial proforma. Firstly, it is essential that developers should understand the income sources generated by the hypothetical centre. As an income property, the centre generates earnings through rental income from the management of a particular activity. In the case of a centre, it is the retail market, and the majority of the lease income comes from the minimum rent paid by the tenants. Therefore, the hypothetical centre size and tenant mix should be defined in line with the market analysis, as misinformation can provide an inaccurate outcome for the decision making.

After that, the estimated cost should be evaluated. This one is divided into two sorts; the first , are the investments costs which includes all costs of the project, such as the land acquisition, offsite improvements, marketing, fees, taxes, financing, leasing commission as well as soft and hard costs. The last one is the annual operating expenses of the centre, which is maintenance, management, property, taxes, and insurance. Kramer (2008) highlights that some expenses can be recovered from tenants and some cannot. Furthermore the budget also includes on-going market costs as well as annual replacement reserve for major periodic maintenance.

From the investor's point of view, expense and profit misestimating directly impacts on their profit margins as the tenant occupancy expenses have a direct effect on the profit margin. Moreover, considering that the minimum rent and the percentage rent paid by the tenants relate to retailing business performance, it is important to understand their relationship with the occupancy expenses to be able to monitor tenants' ability to consistently support this cost and whether they have the capability to absorb any rise in common area maintenance expenses (CAM).

Therefore, the briefing for building design concept upon which the preliminary construction cost and gross leasable area (GLA) is based should be shaped by a multidisciplinary view and include the complete interaction of important stakeholders such as the architect, lease team, engineer and investor. Frequently, the budget is drawn up by using another centre as a reference, while making adjustments for the difference in quality or date when the project was undertaken. According to Kramer (2008), conceptualizing the centre is an interactive communication process in which the developer balances market potentials with available retailers, development concepts and the available site.

Step 3 – site acquisition

In cases where the land has an opportunity to create value and the investor is not the landlord, it will be acquire by the site acquisition method for which the investors' strategy is more suitable (see Kramer, 2008; Vernor,2009 for more details). The value of land is a determining factor in real estate development. For the residual method, the feasibility study provides the land value and the land cost level that can be supported by the investment. Furthermore, the land advantages and disadvantages assessed by economic, financial, marketing, environmental and social patterns can influence the purchase price.

Step 4 – design planning and local government permissions

The centre design is a continuous process which runs in parallel with other development stages and which becomes progressively more detailed as the project progresses. It is a dynamic project in which the design is continually changing according to the tenants' requirements, therefore the stores that will be leased during the development process need to be adaptable. As time goes on, design decisions are made and some specialist consultants work with architects and engineers on elements such as structure, electrical and mechanical services. It is important to highlight that details of the building are driven by the forecasting budget and cannot exceed its limits otherwise this can have a negative impact on the business. It is a complex stage that often requires a project manager. This agent is responsible for organising the architecture and engineering development and supplies the developers with important information about the



compliance schedule and building changes, which can modify costs and gross leasable area. The building design is planned according to time, cost and quality and usually is divided into phases such as feasibility, pre design, selection, design, construction (see Wyatt, 2006; Kohlhepp, 2012 for more details).

In parallel with the design process, local government permission is necessary to allow for building construction and site improvement. It directly influences the development process as the building design progresses according to administrative analysis. Furthermore, delay in approval might interfere in the centre's launch date and changes business strategies.

Step 5 – construction

Construction is the fundamental stage of the development process. The building construction represents the main portion of the investment and as a result a schedule delay or budget overrunning present a high risk for the business. Usually, a great deal of agents is involved in making sure that the centre is built on time and on-budget.

Step 6 – occupation and building operation

According to Wyatt (2006), some development models complete the process at the building occupation stage. Although the building construction completion may seem the end of the development process, it is the start as far as the tenant is concerned. This stage provides the profit to the investor through rental income, which is affected by the occupancy rate. If this does not achieve the number forecasted in the feasibility analysis, the investment will be impaired. Furthermore, forecasting and current operating expenses (e.g. taxes, insurance and CAM) should be compared as a cost increase directly impacts the profit margin and the investment quality.

3. SHOPPING CENTER SUSTAINABLE FEATURES

Sustainable development is defined as the use of environmental resources to meet human needs without compromising them for the use future generations². Nonetheless, sustainable building and sustainability remain subjective as thus far they have no scientific definition. Both terms are habitually used to describe best practices and responsible decision-making, which diminish adverse effects upon the natural environment whilst maintaining the balance among social, economic and environment targets. The first term emphasizes these aims in the building life cycle, from the construction stage until the operation stage. The second term focuses on political and company sustainability development goals using the Triple bottom line to incorporate this notion into business decisions, i.e. business decisions should not be taken merely based on economic objectives but should also consider environmental protection and social justice (see Crawford & Whitson, 2013; Sayce 2013, for more details).

Furthermore, according to Crawford & Whitson (2013) the notion of 'triple bottom line' leads on to the concept of corporate social responsibility (CSR), which involves company initiatives to take responsibility for the effects their decisions have on society, environment, stakeholders and shareholders. Looking into the shopping centre industry, the social responsibility strategies of many landlords encompass their approaches to reduce their carbon footprint using sustainable features in order to try to make their buildings more efficient in their construction and day-to-day operations. However, implementing these characteristics and assessing their performances is adversely affected by the lack of a clear definition.

According to Sayce (2013), landlords worldwide are voluntarily seeking to certify their buildings with some sort of sustainable certificate such as BREEAM and LEED in order to create one sustainable building identity. However, the certification only provides a quick reference point and the lack of a certificate does not indicate that a building is not sustainable or efficient. Thus, rather than focusing on the possibility of gaining

² Sustainable development was defined by The United Nations World Commission on Environment and Development (WCED) in its 1987 report *Our Common Future*. The report defines this term as the development which meets the needs of the current generation without compromising the ability of the future generations to meet their own needs.



a certificate, some little and inexpensive modifications in the building design and operations strategies can aid in lessening the adverse building impact when it is embedded into the company business model.

Besides the impact on nature, there is important evidence of financial benefits in reducing the environmental impact, such as reducing water and energy use costs as well as other utilities that are part of the operating expenses. According to Summerson et al. (2012) building operation generates 80-90% of the total building emissions, due to energy use for heating, cooling, ventilation, lighting and appliances. Furthermore, the authors highlight that the building maintenance and operation can negatively affect the environment in many other ways e.g. resource depletion, habitat destruction, pollution and costs, which are often second only to staff costs and so should be a key target for businesses looking to reduce overheads.

Carrying this aspect further, Buildings are complex structures and it is probable that their components present some negative performance at the implementation or operation cycle when they are assessed by certain sustainability criteria. These criteria encompass a range of environmental, social, economic and physical factors, which could influence the property value and the real estate financial investment decisions (see RICS 2009; Crawford & Whitson, 2013; Sayce, 2013, for more details).

Therefore, the building design takes centre stage when looking into increasing the number of sustainable buildings as it can incorporate environmental requirements into the creation process. This enables economic, social and environmental parameters to be systemically connected through enhancing efficiency and spatial definition quality. In addition, best practices that promote occupier well-being and health while reducing the negative impact on the natural environment such as bioclimatic criteria e.g. natural ventilation, daylight, solar and thermal control should to be the conceptual bases of any architecture design. Architects and engineers have an important role in the improvement of 'green building' since they may propose high-tech or inexpensive design solutions that aid to mitigate the building life cycle's impact on the environment. In the same way, owners and developers should be aware that it is possible to achieve sustainable goals and lessen operation costs using innovative technologies or basic conceptual changes in the design, which help in the operation and maintenance of the building.

Looking into sustainable features, according to the literature reviewed, below is a succinct summary of seven main aspects that must be taken into account at the decision making stage of design planning and business concept development in order to plan a sustainable building.

- Land use

This is important when buildings will be constructed on Brownfield land. The use of contaminated land may occur after soil remediation and the time and costs must be taken into account at the risk management.

- Design

The design has complex factors that can positively or negatively influence the operation and maintenance of the building as well as increase or decrease its impacts on the natural environment. A good design takes into account: building orientation, internal natural light distribution, solar control, natural ventilation, as well as natural parameters of cooling and heating. The building design requires its characteristics to be adapted to the local weather and relief (see Neila, 2004; Crawford & Whitson, 2013 for more details). Furthermore, from the investor point of view the impact of the design on the building's finances and investment profile must be measured.

Another important point to consider is the quality of the spatial definition. The building should be flexible and able to adapt easily to internal changes without generating excessive waste of materials and time. Shopping centres are dynamic business and their physical elements must attend to market necessities without degrading the natural environment.

Accessibility considerations are fundamental as a shopping centre generates a high traffic flow. High Community and environmental impact can undermine the business.

- **Construction materials**

The sort of material used is capable of generating good or bad occupancy conditions as well as increasing and decreasing the impact of the building on the environment. Examples of building materials that might decrease the building maintenance and costs include accredited timber, local stone and reflective glass, while non-recyclable products, non-biodegradable, non-reusable and imported hardwoods and stones when used in the design might be cautiously assessed. The ability to reuse and replace materials tends to improve their life cycle and value as well as embedding this into building use and design can potentially improve rental value as allows some amenities to frequently refresh and replace materials (see Neila, 2004; RICS, 2009 for more details).

Furthermore, material transportation should be taken into account. Purchasing materials far away from the building site can negatively impact the environment through high CO₂ emissions, as their transportation requires high fuel consumption and increases the construction costs

- **Health and wellbeing of the occupier**

The architectural design, construction materials and products used in the operation and maintenance of the building have a direct influence on the health and wellbeing of the occupiers. Sustainable design and construction involves the integration of materials and methods to create strong physical, environmental and human conditions. Thus, material choices and design concept can enhance worker performance and health.

At the design stage, it is important to note that artificially acclimatized spaces are considered complex environments, as the enclosed air has a range of chemical and biological components e.g. toxic substances and microorganisms emitted by a range of fonts that may be interacting according to physical conditions e.g. humidity, air temperature and ventilation. Furthermore, several studies have shown that the air inside enclosed spaces can be more polluting than the air outside, as a result of air conditioning maintenance (see Neila, 2004 for more details).

In addition, well-being encompasses thermal, lighting, visual, acoustic and olfactory comfort. According to Kramer (2008), the use of light in retail areas has demonstrated increases in financial performance through enhanced sales. These factors are thus direct and indirect, and may be recognised where the market understands the benefits they provide and occupants are demanding these benefits

- **Energy**

The building concept might include building design features that minimise operational energy demand, primary energy consumption and CO₂ emissions. Usually the greater portion of energy demand is required to provide thermal comfort inside the shopping centre building. Consequently, the increase of operating costs and 48% to 60% of electricity costs are caused by the air conditioning system. In view of the average management of a shopping centre, this increase has a great impact on the operating cost budget which nowadays can reach up to 45% of the occupancy expenses paid by the tenants to the landlord. Additionally, RICS (2009) highlights that the acknowledged relationship between carbon emitting energy use and climate change has made energy efficiency a matter of legislative compliance and of CSR policy for building owners and occupiers.

- **Water**

The building's water systems have been low cost when compared to other occupational items. However, as an increasingly scarce resource, it is targeted for conservation. In addition, equipment designed to reduce consumption e.g. spray taps, and the use of grey water, particularly for maintenance of landscaped areas, are increasing being used in the building due to the local legislative rules or the CSR policies of the company.

The scale to which a building is designed is important for water conservation. The main use of water in commercial properties is not for drinking purposes, so the benefits of water recycling and reuse is potentially important in locations facing water challenges (RICS, 2009).

- Waste

The management of waste is a key component in environmental and economic development. The building can improve its environmental efficiency, eliminating waste by shifting from waste management to resource recovery practices like recycling materials such as glass, food scraps, paper and cardboard, plastic bottles and metal, from the construction phase to day-to-day operations.

4. EMPIRICAL STUDY

4.1. Methodology and aims

As previously stated in section two, the real estate development process is, for the majority of developers, a subjective process in which individual experiences drives decision making due to the lack of systematic reflection. Thus, this research is defined as empirical as it is based on observations of three aspects that affect development decisions making: [i] the way in which developers commonly set up input data required for feasibility analysis; [ii] stakeholders' perceptions of the application of sustainable features and, [iii] The investors' view of business strategies related to sustainability. Qualitative case study methodology is therefore used to investigate the subjects, which are three shopping centres with different design aspects that do and do not consider sustainable features and are owned by large international companies. In order to delimit location, the Brazilian market was chosen for the two main factors: [i] high growth rate of Greenfield development; [ii] high potential for absorbing new developments according to ICSC data. Furthermore, considering that the centre business model is International (White & Gray, 1996), some circumstances which define the shopping centres alter in each individual case due to local marketability.

The research focuses on the development process, strategies and operation of these three different shopping centre developments in an attempt to identify the opportunities and challenges of investment decision making based on sustainable features. As the spotlight of the study is on investment decision making, the discussion is developed according to an investigation of two development process stages identified in section 2, [i] project feasibility [ii] occupation and building operation. The first topic is examined with the intention of identifying the usual way to generate the information quantified in the proforma and what impact it has on the future running costs and design quality of the building. In turn, the analysis of the second topic aims to identify differences between budget and current costs by making an analysis of the shopping centre operation performance in order to try to draw new premises at the project feasibility stage.

The reason for choosing these three shopping centre projects was that they each represent very diverse characteristics of design even though the spatial definition, size and shopping centre type are similar. The differences are in design strategies that affect the operation of the centre. The first shopping centre analysed was designed with passive cooling/ bioclimatic strategies measured at the design concept stage. The second one is a standard model of a shopping centre with an enclosed track race mall and air conditioning system. The last one presents sustainable features applied to the project in order to get a certification.

The proposal is organised to firstly concentrate on each development process individually and then to establish the connections between them. After that, sustainable strategies are identified which could be applied to a hypothetical concept design used to generate quantifiable information for the analysis of feasibility. To achieve its objectives, the research examines and compares the material provided by the companies and questionnaires answered by some development agents with reference to design methods and managing process and decision making.

The questionnaires mentioned above were responded to in interviews led in an informal manner as semi-structured theme interviews with one or two interviewees at a time and they were free to develop their thoughts without being confined to previously framed answers. Questionnaires were prepared only to drive the conversation through the main points identified in the theoretical part of the research. These questions

also had the secondary aim of establishing a criterion of research to understand communication among the agents and how it is managed during the development process. In addition, some questions remained unanswered, as the development process is subjective and some decision making is confidential to the company. Nonetheless it provided insight into the actions and the strategy of the company at the decision making stage.

Furthermore, it is important to bear in mind that a framework of questions is not an objective research method, being that interviewees have subjective opinions which have to be taken as such. The interviews provide qualitative information and their consistency cannot be proven outright. However they provide a clear and simple method of research whereby questions can be cautiously analysed and offer valuable and up-to-date information. In addition, in order to increase the reliability of the study the same questions were asked a slightly different way during the interviews as well as being answered by different respondents.

4.2. Data comparison and results

In this section, firstly a general overview of the three subjects is presented. It highlights only the main building features such as size, shape and internal spatial definition of the shopping centres. In addition, it is important to note that each shopping centre has its own business characteristics by which it could be described as a business enterprise of its own. These characteristics are linked to local marketability and the marketing strategies of the shopping centre, but when looking into the development process, operation and maintenance of the building these factors are not the foremost driver, although they do have a strong impact on the business strategies. Next, a comparison between the development processes of each shopping centre is presented, emphasising two topics: [i] feasibility project on which a deep financial analysis is made on inputs such as construction costs, operating costs and also the design concept used to produce this information. [ii] Operation and maintenance of the building in which the operating costs and the building cost maintenance is examined. Altogether, the results are focused on the building's sustainability and its investment performance.

Building features of the three shopping centres

The three shopping centres are regional centres and their gross floor area (GFA) and gross leasable area are similar. The shape of the building was chosen in line with the development strategy and their future expansions both decided according to the market research. The buildings also have expansion projects under development or construction. The shopping centre A has a linear form divided into blocks where the façades are positioned according to solar orientation and wind directions. The SC B (the shopping centre without sustainable features) and the SC C (shopping centre with sustainable features), both have a linear form presented in a one rectangular piece. The three buildings have the configuration of a mall, which is an enclosed pedestrian way that connects two facing linear buildings. SC B and C will have a racetrack configuration after the conclusion of their expansions (see Kramer, 2008; Vernor, 2009 for more details).

The three shopping centres have two levels but SC A has some blocks with one level only. The exterior materials create a visual image that is suitable for the community standards and the building entrances to the enclosed mall create a distinctive façade. Lastly, it is important to note that the three SCs are easily accessible by main roads, are located relative to their trade area and have a good visual exposure.

Development process stages

Information on strategies is somewhat confidential, being that they involve the companies' financial and economic details, which could be used by competitors. This situation hinders the supply of the nuts and bolts of the investment analysis and performance evaluation, as well as showing precisely how the companies run their business. Indeed, some information that does not directly entail investment and market value quantification can help the research, in that it provides insight into the companies' actions and the strategy at the decision making stage. In addition, the investment decision making of the three shopping centres was based on the IRR and Market value generated by a DCF of a low risk scenario considering previous shopping centre development as a reference. For SC B and SC C, the investors have used a

sensitive analysis measuring only changes in the construction cost. None of them have considered different scenarios in the market or building operation.

Initially, the investors did not include any sustainable building features as a decision factor to develop a new idea of product, although the owners' corporate social responsibility (CSR) of SC B and SC C encompass some sustainable characteristics such as waste management, reuse of water and efficient energy. Regarding the last aspect, when stakeholders were asked which sort of strategy is often taken to reach the energy efficiency, most of them only commented about the use of peak shaving systems or purchase power on the Open Market as well as the use of skylight. The stakeholders of SC A highlighted that applying the day lighting system without taking into consideration the local climate can cause adverse effects as the heat island effect, i.e. the use of day lighting system can benefit the internal natural light distribution but also can increase the electricity required for air conditioning due to the increase of the internal temperature. This occurs when the building design disregards weather features. Furthermore, it is important to note that the power generator of the peak shaving system usually uses fuel, which increases CO₂ emission but reduces the amount of electricity use by the building during on-peak times. SC C, as it is looking to gain a certification, has opted for the use of natural gas, which is only 20% less polluting than Petrol.

On the other hand, concerning energy demand, SC A demonstrates an interesting point: passive cooling strategies were planned to decrease the operating costs at the decision making stage. This idea was suggested to the investors by the architects and the benefits were measured. However, due to a lack of understanding of the real running costs of a shopping centre with these features, the construction costs and operating expenses budget was calculated based on a building with a traditional air conditioning system in order to provide a low risk scenario for the investment decision making. Thus, the shopping centre was designed for an air conditioning system to be fitted in the building and, in case the passive cooling did not work, it would be installed.

Furthermore, for all three investments, the concept of the product is to develop a space that provides a unique sensation for the costumers. Conversely, there is no evidence that occupant well-being and comfort factors were considered in the idea briefing which the stakeholders used to develop the design concept. The briefing mostly limited these factors to visual comfort provided by decorative elements. The main information provided by the briefings is the GLA, percentage of anchors, megastores and entertainment that can be absorbed by the local market as well as the costumers targeted by the shopping centre.

- Project of feasibility

Design concept

According to the shopping centres' development teams the design concept only considered the aspects concerned with marketability, which means only providing the GLA area and the percentage of anchor megastores and satellites to verify if the site is suitable for the proposed development. More specific information is projected during design development. Comparing the final design of SC B and C with their design concept, significant spatial definition changes were needed to adapt the building to service facilities not measured at the design concept. This lack of operating information can negatively impact the decision making and generate some problems and risks at the project development such as delay and costs overruns.

Conversely, the development team of SC A presented bioclimatic strategies in the first phase of the architecture design, i.e. the architecture development team planned a more detailed design concept to fit the proposal without negatively compromising the GLA during the design development. Thus, other design phases did not suffer a strong negative impact in GLA loss when adapting the building to service facilities that were not measured at the design concept phase. Design changes mostly have been made in accordance with lease team requirements as negotiations with the tenants have advanced.

Construction costs

The construction costs represent the largest portion of the investment at a percentage of between 58% - 65% of the total investment amount. Inaccurate Information can negatively influence the investment.

Frequently, the budget is drawn up using another similar shopping centre as a reference, while making adjustments for the difference in size and site characteristics as well as including a contingency of between 10% and 15% of the total amount planned in order to cover any costs changes. SC B presented a big difference between the budget and forecasting construction cost due to design changes during the development process. According to the SC B stakeholders, the overrunning cost was incurred by some lease team requirements.

With regard to energy demand, the analysis shows that the air conditioning system cost approximately 11% - 18% of the direct building costs. When looking at the case of SC A, this amount represents a saving in the construction cost. SC C has an intelligent air conditioning management system, which increases the air conditioning costs by 7%, but reduces electricity demand.

The SC C uses a hydraulic system designed to reduce water consumption through the use of grey water. The system provides for an increase of 5% on the conventional hydraulic system used by SC A and SC B.

Operating expenses

The three shopping centres used the operating costs budget of their shopping centre portfolio as reference for their proforma inputs. SC B measured the possible decrease of the energy demand due to the use of passive cooling instead of an air conditioning system, but this amount was not taken into account in the investment analysis.

▪ Building Operation comparison

Operating expenses encompasses costs related to building maintenance, management and repairing. The remainder of these costs are called common area maintenance expenses (CAM) which includes the cost of providing electricity, water, sewerage and other utility services to the common area. These costs are paid by the tenants and when the centre has any vacancies the landlords pay for these stores. Changes in the occupancy expenses have a direct outcome on the investors' profit margin and it is important to understand the relationship among rent and occupancy expenses in monitoring whether the tenants are able to maintain these costs and whether they have the capability to absorb any rise in CAM/Taxes/Insurance/utilities.

Energy consumption can reach between 30% - 35% of the CAM and air conditioning systems require more energy than a lighting system. SC A has the lowest consumption of energy per GLA and SC B presents the highest consumption. The difference between them is about 50%. Furthermore the energy efficiency strategies applied in SC C consumes only 3% more energy than shopping centre A. According to the SC B operation team, the high demand of energy from the air conditioning system occurs due to the skylight on the central area near the food court that generates a high heat gain. The three shopping centres present a good day light distribution, not counting the food court in SC B.

The water system is low cost compared to other operating expenses. Usually this cost is among 3% and 5% of the total expenses. However, currently water is a natural resource targeted for conservation due to increasing shortage and in some locations, standard specifications have encouraged supply conservation. Shopping centre C, which has sustainable features, has a greywater and rain water harvesting system that provides a consumption saving of 50% compared to SC B. Regarding waste management, shopping centre C has 60% of waste diverted whereas SC B only has 8% of recycled waste. Furthermore, the operation team of SC C highlights that the shopping centre receives batteries and bulbs for recycling.

▪ Investment performance

The invoicing profile influences the net operating income as it includes rent invoicing and occupancy costs. Furthermore, occupancy cost has to be controlled to maintain the investment quality, considering that the owners pay by vacancy rate and the tenants can or not absorb some rises in costs. SC B analysed the proforma with smaller operating costs than the current amount. This variation in the operating costs was caused by design project changes and it negatively affected the owners' portion of this amount. Consequently, SC B's current market value is greater than the business approved market value due to the retail market performance. As well as this, is important to note that in this centre, occupancy costs



corresponds 52% of the invoicing profile i.e. if the investment decision was taken based on a rent scenario closer to the current market performance, perhaps this value would be less than the business approved market value.

The occupancy cost in a shopping centre with passive cooling (low energy consumption) can reach 40% of the invoicing profile. In this case, operating costs help to increase market value, working with the retail market performance and the minimum rent.

5. COCLUSIONS AND RECOMMENDATIONS

The investment strategy and the investor's decisions are subjective points that require possible economic and marketing scenarios to be assessed. Making decisions to invest in income properties requires a long term vision in which it is essential to think about the possible variables that are connected to future expenses and incomes. In addition, the development process is multidisciplinary and requires complete integration and good communication among agents. Decision making which disregards updated operational practices can generate some risks at the building operation phase. It can also distort the future investment performance analysis instead of providing a reliable, low risk scenario. Furthermore, as evidence shows, integration among operating strategies and design concept can produce positive impacts on the decision making stage and lessen the risk of project changes during the development process. It also allows for a higher quality design.

Sustainable features are still a matter of secondary importance in investment decision making, although they can decrease operating costs and indirectly have a positive impact on the market value. The issue of decreasing energy demand is a point that is worth stakeholders precisely studying at the start of the development process as it is directly connected to the invoicing profile of the shopping centre. Low-cost sustainable strategies such as natural ventilation, solar and thermal control can enhance the design quality, building performance and decrease operating costs. However it requires architects and engineers to better understand these features to be able to support the owners in their decisions. In addition, investors should be aware that a lack of a certificate does not indicate that a building is not sustainable or efficient (Sayce, 2013), as some design changes can positively influence the environmental impact without increasing costs. The development team needs access to information in order to create flexible investments options in order to reduce expenses and measure them in different scenarios. A review of the standard design model used to draw up the construction and operating cost can improve the quality of their investment analysis and reduce any distorted analysis.

This research is limited by the small sample size, as it does not provide concrete parameters of the sustainable feature benefits that can be used in a viability analysis. However, it provides some tips that can drive further studies to provide broader and deeper information to create solid tools for linking green design features to the investment analysis in order to optimize the decision making process when looking into cost savings and design quality.

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