DOI: 10.2478/orga-2026-0024

Modeling the Brand Strength Component in Monetary Brand Valuation Using Fuzzy Logic: Evidence From a Place Brand

Andres KUUSIK, Kristian PENTUS, Kertu LÄÄTS, Liudmyla DOROKHOVA, Oleksandr DOROKHOV

University of Tartu, School of Economics and Business Administration, Tartu, Estonia, andres.kuusik@ut.ee, kristian.pentus@ut.ee, kertu.laats@ut.ee, liudmyla.dorokhova@ut.ee, oleksandr.dorokhov@ut.ee

Purpose: Monetary brand valuation remains a persistent challenge in brand management, due to the absence of transparent approaches for operationalizing brand strength. While financial-based valuation methods are well established, the integration of perceptual and behavioral dimensions into monetary frameworks remains limited. The purpose of this study is to develop and test a methodological approach for modeling the Brand Strength component within monetary brand valuation. The approach is operationalized as an interpretable fuzzy inference model that integrates perceptual data, objective indicators, and expert knowledge. The case of Ülemiste City in Tallinn, Estonia, is used as an empirical example to demonstrate and test the approach's practical applicability.
Design/methodology/approach: The study proposes a fuzzy framework for estimating brand strength in monetary brand valuation. The approach integrates heterogeneous data sources, including survey-based perceptions, objective indicators, and expert knowledge, within a rule-based, interpretable model. The model is empirically demonstrated through an application to the Ülemiste City place brand.
Findings: The results show that this model produces consistent, interpretable brand-strength coefficients and supports two complementary use cases: internal, target-based brand management and cross-brand comparability. The findings demonstrate that fuzzy logic provides a practical mechanism for combining diverse sources of brand-related information into a coherent monetary valuation framework.
Originality/value: This study advances brand management by offering a transparent method for integrating brand strength into monetary valuation, linking financial metrics with perception-based assessments. Given the lack of a widely accepted, publicly available method for calculating the monetary value of brands, the proposed framework offers both theoretical and practical value. It provides managers with a diagnostically useful and adaptable tool for brand valuation while enhancing the interpretability of monetary brand assessment.

Keywords: Brand value, Brand strength, Brand evaluation, Fuzzy logic approach

1 Introduction

In every domain where competition and the need for differentiation exist, brand management is essential (Aaker, 1996; Keller, 2013). Brands serve as powerful marketing instruments that influence not only customers' choices (Keller, 2020) but also shape values, consumption practices, and rituals (Rindell et al., 2015) and affect the preferences of employees and job seekers (Kimpakorn and Tocquer, 2010). A brand can also function as a managerial decision-making tool, shaping strategic priorities and guiding investment choices (Kapferer, 2012). Brands are

Received: 24th March 2026; Accepted: 27th June 2026

intangible assets – economic resources that can be bought, sold, or licensed, and that generate measurable financial value (Salinas and Ambler, 2009; ISO 10668:2010).

Given these roles, the brand value and its assessment are critical. While the literature has extensively covered brand equity – that is, how brands influence consumer behavior and perceptions (Christodoulides and de Chernatony, 2010) – far less attention has been devoted to methods for assessing a brand's monetary value. Currently, no single, universally accepted, and publicly transparent methodology for brand valuation exists. Consultancy firms such as Interbrand, Brand Finance, and Kantar each use proprietary methods that often yield widely different results. For example, the estimated value of the Apple brand in 2025 ranged from approximately USD 470.9 billion (Interbrand, 2025) to USD 1,299.6 billion (Kantar, 2025) to USD 574.5 billion (Brand Finance, 2026). Although the ISO standard (ISO 10668:2010) specifies certain requirements for monetary brand valuation, it still leaves considerable room for interpretation.

Most brand valuation methodologies consist of two components: a financial estimate based on future cash flows and a brand-strength component derived from consumer perceptions, brand equity constructs, or other indicators used to adjust the financial baseline. It is precisely this brand-strength component that varies most across models, is often undisclosed, and is only loosely specified in existing standards (Leite, 2024). This article, therefore, focuses on the methodology for determining and measuring the brand-strength component.

The methodology we propose is broadly applicable across categories; however, category-specific nuances exist. Therefore, we apply it to the context of place branding. Although most research on place brands focuses on tourism destinations (e.g., Duman et al., 2018; Foroudi et al., 2018), we examine place brands from the perspective of technology and start-up firms. Many cities and regions today compete to attract investment and talent (Mashiah, 2024). Business parks and innovation districts are part of this competitive landscape, functioning as strategic instruments for shaping place brands through the interplay of urban design, economic clustering, and identity formation. A leading example is the Stanford Research Park in Palo Alto, founded in 1951, which attracted major technology firms and helped position Palo Alto – and, by extension, Silicon Valley – as a global innovation hub (Kenney and Mowery, 2014).

The literature on place marketing and branding is extensive (Lucarelli and Berg, 2011). Although countries and regions as brands have long been studied, their economic implications have received systematic attention only more recently (Oh et al., 2020). Existing research provides comprehensive overviews of brand equity measurement approaches (Cristea and Munteanu, 2022) and includes various models for assessing place brand equity (Benedek, 2017; Rahman, 2018; Sokolowska, 2022). However, relatively little attention has been paid to place brand equity from an entrepreneurial or talent perspective, with only limited examples, such as Jacobsen (2010), in the context of creative industries.

The objective of this study is to develop and test a transparent, flexible approach to modeling the brand-strength component of monetary brand valuation by integrating perceptual and objective data through a fuzzy inference system. The approach is implemented as a computational model using MATLAB's Fuzzy Logic Toolbox and is applied to the case of Ülemiste City (Tallinn, Estonia) to demonstrate its practical applicability.

The primary contribution of this study lies in the development of a methodological approach to modeling the brand strength component within the framework of monetary brand valuation. The proposed approach is operationalized as a computational model based on a fuzzy inference system (FIS) that integrates objective metrics, stakeholder perception data, and expert knowledge through interpretable linguistic rules. Thus, the study goes beyond merely developing a conceptual model or describing a single case study; Ülemiste City serves as an empirical case to demonstrate, test, and illustrate the practical applicability of the developed methodological approach. Additionally, the study compares two model specifications—goal-oriented and customer-oriented—thereby highlighting the distinction between the model's managerial utility and its potential for cross-brand comparability.

In recent years, advanced modeling approaches – including neural networks, agent-based simulations, genetic algorithms, and machine learning – have gained increasing prominence in marketing and decision-making research (Hair et al., 2021; Wedel and Kannan, 2016). Among these, fuzzy logic, originally developed by Zadeh (1965), has proven particularly suitable for modeling complex systems characterized by incomplete or imprecise data (Scott, 2023). Unlike classical logic, which relies on binary distinctions, fuzzy logic allows for degrees of truth, enabling more nuanced representation of real-world phenomena (Fuzzy Logic, 2021). The proposed methodology, therefore, relies on a fuzzy inference system (FIS), which provides a formal, mathematically grounded framework for integrating heterogeneous data and supporting multi-criteria decision-making under uncertainty.

The empirical foundation of this article rests on a case study conducted in 2024–2025, using data collected from Ülemiste City and supplemented by additional surveys, to estimate the monetary value of the park's brand using the proposed fuzzy approach.

The scientific contribution of this study lies primarily in the development of a methodological approach for quantitatively assessing the "Brand Strength" component within the framework of monetary brand valuation. Unlike approaches that either treat this component as an aggregate

index or leave it insufficiently formalized, the proposed approach employs a fuzzy inference system to integrate objective metrics, stakeholder perceptions, and expert knowledge into a single, interpretable model. A significant aspect of this contribution is the development of two complementary model specifications: one oriented toward the organization's strategic goals and the other toward customer perceptions. The former is designed primarily for managerial diagnostics and the assessment of target achievement, whereas the latter ensures greater comparability of results across brands. Thus, the study offers not only a tool for calculating the brand strength metric but also a methodological foundation for its use as a component of monetary brand valuation for various analytical purposes.

2 Literature background

Place brands are embedded in broader processes of urban development and governance rather than functioning solely as communication or marketing constructs. In the context of cities and regions, technological and social innovations increasingly influence governance processes, citizen participation, and the creation of public value (Roblek et al., 2020). This perspective suggests that the strength of a place brand may also reflect heterogeneous perceptions and contextual characteristics associated with the broader urban environment. However, incorporating such heterogeneous perceptual and contextual information into monetary brand valuation remains challenging. Existing valuation approaches offer relatively limited guidance on how to operationalize brand strength in a transparent and interpretable manner.

2.1 Assessment of place brand value from the perspective of technology and start-up firms

Brand value assessment models are broadly divided into marketing, organizational, and financial models. Marketing models primarily focus on the value the brand creates for consumers; organizational models emphasize the brand as a source of additional income; and financial models view the brand as an asset with economic value that can be bought and sold at a specific price.

In marketing models, brand value is referred to as brand equity – the added value created for a product through marketing investments (Tuominen, 1999). Aaker (1991) defines brand equity as a set of assets and liabilities linked to a brand that add to or subtract from the value of a product or service. These assets and liabilities may include product features added to the base product, but they may also take the form of promises made by the brand owner or associations formed by consumers when interacting with the brand.

In organizational models, brand value is defined as the additional revenue that a brand generates for a company (Kapferer, 2012; Roblek and Meško, 2020). In this view, brand value represents the commercial value derived from consumers' perceptions of and interactions with the brand. Keller (2020) further explains that brand value manifests financially through price premiums, repeat purchases, and increased acquisition rates, making it a strong and credible reference for this context.

In financial models, the brand is regarded as an intangible asset that contributes to a company's overall value and competitive strength (Sahin, 2021; Pukala, 2021). Numerous approaches exist for estimating the monetary value of a brand, ranging from cost-based to market-based methods. In practice, the most widely recognized valuations are those produced by major consultancy firms such as Kantar and Interbrand. These providers incorporate measures of brand equity into their assessment frameworks, thereby linking brand equity with brand value (Leite, 2024). According to ISO 10668, a comprehensive valuation should integrate both financial performance and brand strength considerations, ensuring that the calculated brand value reflects not only expected economic returns but also the intangible drivers of those returns, such as consumer perceptions and market position (ISO 10668:2010). The present study follows a similar conceptual approach by integrating brand equity–related indicators into financial brand valuation.

For the financial component of brand valuation, the literature generally recommends relying on income-based and market-based approaches (Mellen and Evans, 2010; Mard et al., 2007; Hitchner, 2006; Reilly and Dandekar, 1997). Market-based models (also known as the market comparison approach) estimate brand value using data from comparable firms and valuation multiples such as P/E, P/B, P/S, EV/Sales, or EV/EBITDA. The general formula is: Brand Value = (Valuation Multiple of Comparable Firm × Corresponding Financial Indicator of the Valued Firm) − Net Debt.

When relevant comparables and accessible data exist, this method is straightforward, transparent, and well-suited to publicly listed firms. However, it becomes unreliable when comparable data are unavailable or incomplete and may underestimate the potential of emerging or high-growth companies.

Income-based models, by contrast, value brands based on expected future cash flows. The discounted cash flow (DCF) method incorporates projected free cash flows, discount and capitalization rates, growth assumptions, and net debt. It is widely accepted and forward-looking, allowing future income to be reflected in the valuation.

However, it requires detailed financial data and realistic forecasts, making the results highly sensitive to underlying assumptions.

For the brand strength component, we identify the following value-creating factors based on the brand equity literature (Aaker, 1991; 1996; de Chernatony et al., 2011; Berry, 2000; Burmann et al., 2009; Morgan and Hunt, 1994; Carroll and Ahuvia, 2006; Stokburger-Sauer et al., 2012; Oliver, 1999; Keller, 2001):

- Brand awareness – the extent to which people are aware of the brand's existence and familiar with the value it offers;
- Brand associations – all positive and negative associations related to both functional characteristics and symbolic or emotional aspects of the brand;
- Perceived quality – although a form of brand association, it is often treated as a separate construct due to its importance and its close relationship with satisfaction;
- Satisfaction – consumers' evaluation of how well the brand meets their expectations;
- Relevance – the extent to which the brand's value proposition aligns with the needs of its target audience;
- Likeability – the emotions and attitudes consumers hold toward the brand;
- Trust – the perception that the brand will deliver on its promises;
- Loyalty – attachment to the brand, expressed through advocacy, preference, and repeat purchasing;
- Differentiation – the degree to which the brand stands out and provides a reason for preference;
- Similarity – customers' identification with the brand's personality.

Consulting firms base their assessments of brand strength on related constructs. Interbrand (n.d.) distinguishes between brand role and brand strength. Brand role is measured through surveys assessing the extent to which a brand influences consumer decision-making. Brand strength consists of three subcomponents:

- Management, including clarity of purpose, organizational alignment, responsiveness, and agility;
- Relationship, encompassing differentiation, consistency, and engagement;
- Relevance, including awareness of promises, perceived fulfillment, emotional connection, and likeability.

Young and Rubicam's Brand Asset Valuator (BAV) similarly focuses on brand strength and adds a measure of brand stature. Brand strength consists of differentiation, relevance, and energy (the brand's future potential), while brand stature comprises awareness and respect (Y&R, n.d.). Kantar's BrandZ methodology combines revenue forecasts with a brand's non-financial contribution, consisting of three components: Relevance, Difference, and Salience (Kantar n.d.). Brand Finance's methodology combines revenue projections with royalty rate estimation and brand strength, which includes three components: Investment, Equity, and Performance (Haigh, 2021). In the context of place branding, the brand value of cities and regions has typically been assessed through a tourism lens. Anholt (2006) identifies key components of city brand equity, including existence, reputation, place, potential, lifestyle, people, and prerequisites.

The Saffron European City Brand Barometer considers factors such as residents' pride, recognizable symbols, ambition and business climate, attractions, accessibility, storytelling potential, and overall distinctiveness (Saffron, 2019).

Focusing on business cities, Sokołowska et al (2022) develop a framework based on four categories: perceived value, perception, engagement, and loyalty. From the perspective of technology and start-up ecosystems, several factors influence place attractiveness and brand value:

- abundance of start-ups and collaboration among them (Tripathi et al., 2019);
- availability and quality of human capital (Baron and Harima, 2019);
- presence of educational institutions providing relevant skills (Gauthier et al., 2020);
- availability of incubators, accelerators, and business services (Blank, 2021);
- access to investment opportunities (Blank, 2021);
- geographical location relative to markets and technologies (Haines, 2016);
- corporate social responsibility (Mochales and Blanch, 2022);
- events targeting start-ups and innovators (Cukier et al., 2016; Richards, 2017).

Additionally, Jacobsen (2010) identifies three groups of value components for city brands:

- Functional benefits – lifestyle, education, well-being, employment opportunities, infrastructure, and price–quality ratio;
- Experiential benefits – sensory, cultural, and entertainment experiences;
- Symbolic rewards – social and psychological benefits such as prestige, identity, and belonging.

2.2 Theoretical framework for assessing place brand strength

Based on the preceding literature review, we propose a framework comprising six factors for assessing the strength of a place brand from the perspective of technology and start-up enterprises.

Drawing on Jacobsen's (2010) classification, three foundational dimensions – Functional Benefits, Experiential Benefits, and Symbolic Rewards – are included. To these, we add the Brand Energy component, the Manage-

ment component, and the Brand Relationship dimension, which captures the brand's role and importance in decision-making processes.

Functional Benefits

Functional benefits encompass associations, perceived quality, and satisfaction with the brand's functional attributes. These reflect the tangible, utilitarian aspects of the place brand most relevant to technology and start-up companies. Key factors include:

Economic potential

- Economic, employment, and educational opportunities (Anholt, 2006; Jacobsen, 2010; Sokołowska et al., 2022; Gauthier et al., 2020);
- Real estate market conditions (Jacobsen, 2010);
- Technology availability and accessibility (Jacobsen, 2010);
- Volume and accessibility of investment opportunities (Blank, 2021);
- Availability and quality of incubators, accelerators, and business services (Blank, 2021).

Access

- Accessibility, location, and convenience (Saffron, 2019; Haines, 2016).

Community

- Community and density of start-ups, availability of human capital, and frequency of networking events (Anholt, 2006; Tripathi et al., 2019; Baron and Harima, 2019; Cukier et al., 2016; Richards, 2017).

Experiential Benefits

Experiential benefits capture the emotional and sensory appeal of a place, reflecting its attractiveness and liveability. They encompass:

- Work and living environment – the city's physical conditions, lifestyle, and rhythm (Anholt, 2006; Sokołowska et al., 2022);
- Quality of living conditions (Anholt, 2006; Sokołowska et al., 2022);
- Visual identity and design coherence (Sokołowska et al., 2022);
- Sensory experiences, including aesthetic, cultural, culinary, and entertainment dimensions (Jacobsen, 2010).

Symbolic Rewards

Symbolic rewards reflect the social and psychological value associated with the place brand:

- Similarity and self-identification with the place (Sokołowska et al., 2022; Jacobsen, 2010);
- Brand stature, composed of awareness and respect (Jacobsen, 2010; Anholt, 2006; Sokołowska et al., 2022);
- Residents' pride in the city (Saffron, 2019);
- Stories and contextual narratives associated with the place (Saffron, 2019).

Brand Energy

Brand energy reflects the vitality, momentum, and distinctiveness of the brand – its capacity to remain meaningful and future-oriented. This factor draws from Kantar's BrandZ, Interbrand, and Y&R methodologies and includes:

- Relevance – the brand's meaningfulness and usefulness for its audiences;
- Difference – distinctiveness from competitors, including city differentiators, landmarks, symbols, attractions, and anomalies (Saffron, 2019);
- Salience – the likelihood of being recalled first in decision-making contexts;
- Future orientation and the ability to meet emerging needs;
- "Wow" factors and distinctive attractions (Saffron, 2019);
- Corporate social responsibility (Mochales and Blanch, 2022).

Management

The management dimension captures the organizational and strategic capacity behind the brand. It draws from Interbrand and Brand Finance frameworks:

- Investment – marketing budget, visual identity, innovation, service (Piwowar-Sulej et al., 2023);
- Engagement, agility, feedback mechanisms, vision, and fulfillment of brand promises;
- City ambition, vision, and business climate (Saffron, 2019);
- Dialogue, co-creation, and stakeholder collaboration (Sokołowska et al., 2022).

Brand relationship

The final factor, Brand Relationship, captures the emotional and behavioral ties between the brand and its target audiences. It reflects how the brand drives preference and long-term commitment:

- Loyalty and price elasticity;
- Customer acquisition and market share;
- Trust and perceived reliability;
- Role and relevance in decision-making processes;
- Emotional engagement (Sokołowska et al., 2022).

2.3 Fuzzy methods in brand evaluation and place branding

A wide range of methodologies has been developed for evaluating brands, differing in purpose, data requirements, and degree of subjectivity. They can be grouped into three categories: methods capturing customer perceptions, performance-based approaches, and multi-component models that combine perceptual and financial indicators (Cristea and Munteanu, 2022). And the common challenge is integrating heterogeneous data – objective financial indicators and subjective perceptions – within a coherent, transparent framework. This challenge is particularly pronounced in

place branding, where brand strength is inherently multidimensional and context-dependent.

Fuzzy logic provides a suitable methodological foundation for addressing this problem. Introduced by Zadeh (1965), it enables the formal representation of uncertainty, ambiguity, and imprecision – conditions that characterize most brand-related judgments (Fuzzy Logic, 2021; Scott, 2023). Unlike classical binary logic, fuzzy logic operates with degrees of truth, allowing linguistic and qualitative assessments to be expressed within a mathematical framework. This makes it particularly well-suited for integrating diverse inputs, including expert judgments, survey responses, and numerical indicators measured on different scales. Fuzzy systems do not require normalization or extensive preprocessing of input data, thereby reducing data-handling complexity and preserving information richness (Magni et al., 2006; Malagoli et al., 2007; Wang and Yu, 2015).

Fuzzy logic has been successfully applied across multiple disciplines, including industrial processes, business decision-making, artificial intelligence, and machine learning (Wang et al., 2021; Scott, 2023; Dorokhova et al., 2024). In branding, it has been used to assess the relationship between brand equity and financial performance by combining stock market and operational indicators (Bhaskaran et al., 2023), to identify configurations of successful brand outcomes (Sakas et al., 2022; Torres et al., 2018). Applications in product and corporate branding further demonstrate its versatility: fuzzy models have been used to quantify brand value (Stojanovic, 2019), while AHP–fuzzy have been applied to evaluate luxury brands by integrating market, consumer, environmental, and innovation factors (Guo, 2017; Wang and Huang, 2021). Fuzzy multi-criteria decision-making has been employed to evaluate brand performance and rank alternatives by combining expert knowledge with quantitative data (Duan et al., 2017; Dinçer et al., 2020).

In the context of place branding, fuzzy methods have been applied to assess city attractiveness and competitiveness by integrating economic, social, and perceptual dimensions (Chou, 2017; Erdogan et al., 2018; Amerian, 2021), highlighting their ability to capture the interplay between objective conditions and stakeholder perceptions. The adaptability of fuzzy logic makes it well-suited to assessing place brand strength and competitiveness, as it enables decision-makers to integrate a wide range of quantitative and qualitative inputs, including perceptions of brand image, institutional effectiveness, innovation capacity, and social cohesion (Hereźniak et al., 2018).

Overall, the literature suggests that fuzzy logic provides a flexible, interpretable framework for integrating qualitative and quantitative information in brand evaluation. Its advantages include the ability to process imprecise inputs, integrate expert knowledge, and produce transparent, multi-criteria assessments.

Building on this foundation, this study applies fuzzy modeling specifically to operationalize the brand strength component in monetary brand valuation. It extends existing fuzzy methods from general brand evaluation toward an integration with financial valuation frameworks.

Compared to existing brand valuation models, the proposed approach offers several methodological advantages. First, it renders the "Brand Strength" component explicitly formalized and interpretable: rather than relying on an aggregate indicator or an opaque expert-derived coefficient, its value is derived through a hierarchical system of metrics and fuzzy inference rules. These fuzzy rules are constructed based primarily on expert knowledge about the relationships between the criteria and the overall brand value of a Business City. The rules have the form "IF–THEN": for example, IF economic performance is High AND accessibility is High AND business environment is Medium, THEN brand value is High. The initial rule base is therefore knowledge-driven rather than statistically learned from a large dataset. The rules are then checked and calibrated by comparing model outputs with expert assessments and benchmark data, and by analyzing the model's sensitivity to changes in the rules and their parameters.

Second, the model enables the simultaneous integration of objective performance metrics, stakeholder perception data, and expert knowledge—a capability particularly valuable when dealing with heterogeneous or incomplete information or subjective assessments. For this, we use triangular membership functions to transform both quantitative and qualitative assessments into a common fuzzy scale, typically represented by linguistic terms such as Low, Medium, and High. Triangular membership functions were selected because they are simple, transparent, computationally efficient, and easy to interpret. They also allow us to represent gradual transitions between linguistic categories such as Low, Medium, and High without assuming artificial precision in expert assessments. The membership functions are not generated automatically by the fuzzy system. They are defined during the model design stage based on the scale and meaning of each criterion, available data, expert knowledge, and benchmark values from comparable business cities. For quantitative criteria, the scale is normalized using meaningful lower and upper bounds, with the upper bound tied to the best observed performance among comparable business cities. For qualitative criteria, the boundaries are determined using expert judgment and the semantics of the assessment scale.

Third, the model's structure is flexible, allowing it to adapt to the specific characteristics of a brand, industry, or region without altering the underlying valuation logic.

Fourth, the distinction between goal-oriented and customer-oriented specifications allows for the separation of two distinct analytical tasks: the internal assessment of strategic goal achievement and cross-brand comparison. Finally, the model's output links directly to monetary val-

uation through a transparent mechanism for generating the "Brand Strength" multiplier. Thus, the proposed model does not replace existing financial brand valuation methods but rather provides a more formalized and interpretable way to determine one of the key non-financial components of such valuations.

3 Methodology

3.1 Data and conceptual model

Ülemiste City is a business campus in Tallinn, Estonia. It has been developed as a knowledge-based environment that integrates workplace, learning, and living functions to foster innovation, talent development, and business growth. Nearly 400 companies operate here, generating a combined annual turnover exceeding €2.5 billion. In terms of labor tax contributions, the campus ranks third in Estonia after Tallinn and Tartu. It hosts a significant share of Estonia's IT sector, with companies that export approximately three-quarters of their output – twice the national average – and account for roughly one-third of the country's total IT exports.

A distinctive feature of Ülemiste City is its systematic collection and use of data to guide development. Substantial data, along with the associated development targets, is publicly available via the ÜC Radar (https://www.ulemistecity.ee/en/radar-en/). The dataset of 300 indicators is grouped into categories: Economy, Environment, Science, Community, Services, Talent, and General Management.

From this dataset, we selected indicators that aligned with the theoretical framework for assessing brand strength. Additionally, we conducted a survey among Ülemiste City tenants between 13 May and 1 November 2024. The survey consisted of 26 statements evaluated on a 1–10 scale. One construct – relevance of differentiation – was measured in two stages: first, respondents were asked to identify one to three factors that differentiate Ülemiste City from other business campuses; second, they evaluated the importance of these factors. The questionnaire is provided in Appendix A. A total of 58 respondents participated (approximately 15% of tenant representatives). Of these, 84.5% identified themselves as board members, owners, or managers, while 15.5% were other staff.

Compared to the theoretical model, the empirical model includes several adjustments. In the theoretical framework, functional benefits were divided into three subcategories. As each subcategory contained a substantial number of measurable indicators, the higher-level category was removed, and the subcategories were elevated to the same level as the remaining dimensions. Accordingly, three distinct categories were defined: Economic Potential, Accessibility, and Community. Experiential benefits were operationalized more specifically as the work and living environment within the campus. Because the categories Symbolic Rewards, Relationship, and Governance contained fewer empirical indicators, they were combined into a single category – Brand Involvement. The final structure of the brand strength model is presented in Figure 1. The indicators included are listed in Appendix B and detailed in the Methodology section.

The fuzzy approach requires specifying the minimum and maximum values for each parameter. Depending on the nature of the parameter, threshold values are determined either based on established standards within a given domain (e.g., a high level of satisfaction defined as values above 75%) or derived from the empirical data distribution when no external benchmarks are available. As these threshold values directly influence the resulting brand strength score, particular attention was given to their selection. For the numerical implementation in this study, the target values defined by Ülemiste City were used as the upper bounds for the respective indicators. In cases where no explicit targets were available, benchmark values were derived from comparable high-performing contexts or best-practice reference points identified in the literature and industry reports.

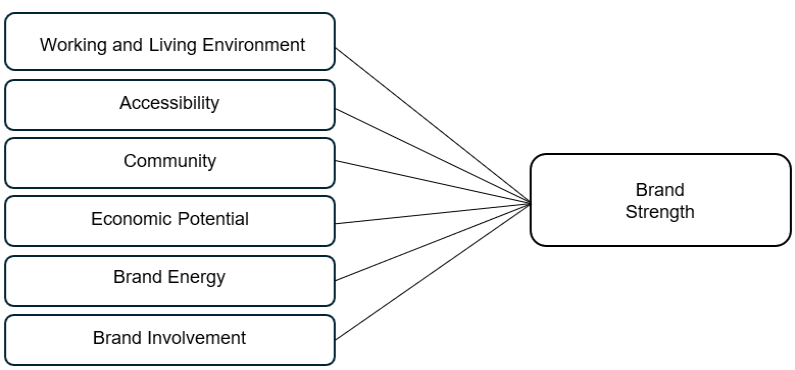


Figure 1: Components of brand strength multiplier
Source: Authors' own compilation

3.2 The financial component and assumptions of the empirical model

To estimate the financial component, we apply an income-based discounted cash flow (DCF) method as follows:

$$FCFF=(EBIT+DA-\Delta NWC-CAPEX)\times(1-TAX)$$

where:

- FCFF – free cash flow to the firm
- EBIT – earnings before interest and taxes
- DA – depreciation and amortization
- ΔNWC – change in net working capital
- CAPEX – capital expenditures
- TAX – corporate income tax rate

A five-year forecast horizon is commonly used in practice, as it allows for reasonably reliable projections. The projected future cash flows are discounted to present value using the weighted average cost of capital (WACC). The financial component is estimated using the most reliable available forecasting assumptions. For example, revenue projections incorporate the square meters of existing and planned buildings, expected occupancy rates, market rental prices, and general macroeconomic conditions. As a result, the financial component represents a conservative estimate of an average market-based value, unaffected by brand equity.

We adopt two core assumptions to structure the empirical model. The first assumption is that the Brand Strength component can only increase the brand's monetary value. In other words, if a brand is weak, its value equals its financial component. As brand strength increases, it proportionally amplifies the financial baseline. The Brand Strength component is not assumed to reduce the monetary value derived from the financial component, as the latter is constructed as a conservative estimate. While prior research acknowledges that brands may also generate negative effects, manifesting as negative brand equity or brand avoidance (Aaker, 1991; Keller, 1993; Lee et al., 2009; Hegner et al., 2017), this study assumes that the brand strength component does not reduce the financial baseline. This is because the financial component is modeled as a conservative estimate that already reflects potential downside risks, including unfavorable brand perceptions, within projected cash flows. The brand strength component, therefore, captures only the positive contribution of the brand relative to this baseline.

The second assumption concerns the upper bound of the Brand Strength effect. We assume that the influence of the Brand Strength component does not exceed a factor of two. Existing research demonstrates that brand equity increases consumers' willingness to pay a price premium (e.g., Aminu and Ahmad, 2018; Fatma and Khan, 2024; Kusum et al., 2003), although precise quantitative estimates vary across contexts. Empirical evidence suggests that consumers may be willing to pay up to 25% more for preferred brands (UserTesting.com, 2025). The upper bound of a twofold increase in value is therefore introduced as an assumption to be further examined and refined in future research, rather than as a universally established empirical constant.

It reflects two considerations.

First, willingness to pay varies significantly across categories and contexts.

Second, brand-related value arises not only from price premiums but also from behavioral effects, such as higher conversion rates and longer customer relationships. In the context of a business campus, this may translate into shorter tenant acquisition periods, longer lease durations, and higher occupancy rates.

Taken together, these assumptions imply that the Brand Strength multiplier ranges between 1 and 2. The fuzzy model produces a score between 0 and 100; to derive the Brand Strength multiplier, the score is divided by 100 and added to 1.

3.3 Fuzzy approach implementation

The proposed approach and the corresponding computational model are based on a Fuzzy Inference System (FIS). FIS provides a mathematically grounded framework

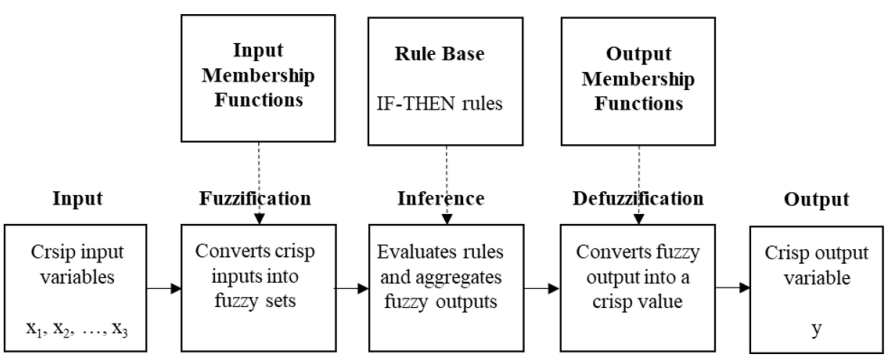


Figure 2: Classical FIS workflow
Source: Authors' own compilation

for processing knowledge under conditions of uncertainty, incompleteness, and imprecision (Stojanovic, 2019; Scott, 2023). It is well-suited for multi-criteria decision-making and expert-based evaluation, where both quantitative and qualitative inputs must be integrated. Unlike deterministic models that rely on binary logic (true/false), FIS operates with linguistic fuzzy variables.

This enables the formalization of expert reasoning and allows direct integration of input variables measured on different scales, without preprocessing or normalization. A classical FIS consists of functional components, as illustrated in Figure 2.

The fuzzification block transforms crisp input variables into fuzzy values using membership functions that specify the degree to which each value corresponds to a linguistic term. The knowledge base consists of two elements: a database that defines the membership functions of the input and output variables, and a rule base composed of "if–then" statements that formalize expert knowledge. The fuzzy inference system evaluates and aggregates the rules to generate a fuzzy result. After it defuzzified into a crisp output value, enabling interpretation and decision-making.

In this case, membership functions are not automatically derived from the data. They are determined and parameterized during the model construction stage using expert knowledge, criterion scale characteristics, and benchmark values. Therefore, membership functions are constructed or specified, rather than automatically derived from the data. The parameters of the membership functions are model assumptions informed by expert knowledge and benchmark data. They should therefore be treated as calibratable parameters rather than universal constants. So, one direction for further development is to calibrate and validate these parameters using a larger dataset of comparable business cities and to conduct sensitivity analysis.

Fuzzification, inference, and defuzzification are implemented using MATLAB Fuzzy Toolbox. The model follows a hierarchical structure where lower-level indicators are aggregated into higher-level constructs, ultimately yielding an overall brand strength score. Examples of model components are provided in Appendix B. FIS enables the integration of formalized and heuristic knowledge, supports the analysis of incomplete or partial data, and produces outputs suitable for diagnostic and decision-making. Compared to classical expert systems, FIS allows for graded rather than binary reasoning. Compared with statistical and machine learning methods, it requires less data and maintains greater transparency, although it is less suited to automated pattern discovery. Overall, fuzzy inference systems are appropriate for contexts that require integrating quantitative data and qualitative expert judgment while preserving interpretability and transparency. This aligns directly with the objective of modeling the brand-strength component in monetary brand valuation.

3.4 Criteria definition and model implementation in MATLAB

As the first step in model construction, a set of criteria was defined, including first-level (primary) and second-level (supporting) variables. The criteria were grouped by the main dimensions of the Business City brand value. Then, for each group, experts identified the expected direction and relative importance of relationships between the input criteria and the output. These relationships were translated into linguistic IF–THEN rules. The rule base was subsequently reviewed to eliminate contradictions, redundancy, and implausible combinations. There's no need to build rules for all 80 criteria simultaneously. Criteria are logically grouped, and the FIS is hierarchical/multi-level: first, several criteria → intermediate indicators → final Brand Value. The objective of calibration was not to force a particular result, but to ensure that the model behaves consistently with expert expectations and benchmark observations.

Table 1: The results, brand strength coefficient, and its main components

Brand-strength components and Final results	A. The obtained brand strength coefficient and its main components for the test example	B. The alternative brand strength coefficient and its components for the test example (based only on customer evaluations from the survey)
Working and Living Environment (IR1)	68,61	78,52
Accessibility (IR2)	36,92	50,00
Community (IR3)	61,04	49,88
Economic Potential (IR4)	44,39	50,00
Brand Energy (IR5)	48,80	99,18
Brand Involvement (IR6)	75,98	80,81
Brand Strength (F)	58,86	68,07

Source: Authors' own calculation

Table B1 (Appendix B) presents the criteria, units of measurement, direction of influence on the outcome, and corresponding model variables. The influence direction is defined as "direct" (an increase in the criterion value leads to an improvement in the overall assessment) and "inverse" (if it reduces the assessment). In this model, mostly, the criteria have a direct influence (only two variables have an inverse influence). The criteria are structured hierarchically into three levels: initial, intermediate, and aggregate. Their aggregation results in the final brand strength score. The hierarchical structure is shown in Figure B1.

For model implementation in MATLAB, boundary values (minimum and maximum) were specified for each input parameter. These values are provided in Table B1, along with the numerical inputs used in the empirical example. A key feature of the proposed approach is that input variables can be used in their original measurement units without normalization or transformation. The model produces intermediate and final outputs on a scale of 1 to 100, with higher values indicating stronger brand performance. The computational model was implemented in MATLAB, as shown in Figure B2. It illustrates fragments of the fuzzy inference, membership functions, and rule-based relationships between input variables.

The consistency of the rule base is ensured by checking the rules for contradictions, redundancy, and logical plausibility. The rules are formulated using the same linguistic scales and are reviewed against expert knowledge and the expected relationships between criteria and brand value. We also test the model response to different combinations of inputs to identify unexpected or contradictory outputs. Given the large number of criteria, consistency is assessed at the level of logically connected groups of criteria and through systematic model testing rather than by manually checking every possible combination. In the current version, consistency is primarily ensured through expert validation and systematic testing of the rule base. A formal automated consistency-checking procedure is a possible direction for further development of the model.

The visualizations demonstrate how changes in input parameters (e.g., satisfaction or accessibility) translate into variations in intermediate and final outputs, thereby enhancing the model's interpretability. The results of the numerical calculations, including intermediate and final outputs, are presented in Table 1.

3.5 Model verification and robustness

To ensure the model's internal consistency, its behavior was tested under boundary conditions. Extreme input values (minimum and maximum) were used to verify that the resulting outputs follow logically consistent patterns (higher input values leading to higher overall scores where appropriate). Also, selected fuzzy inference surfaces were examined to confirm the expected relationships between input variables and outputs. These checks provide confidence that the rule base and aggregation structure behave consistently and are interpretable. When certain input data are unavailable, the model allows scenario-based estimation by assigning minimum, average, or maximum values to the missing parameters. This enables the generation of pessimistic, baseline, and optimistic estimates, supporting decision-making under uncertainty.

Sensitivity analysis examines how changes in input criteria affect the final brand value. We vary selected input values within reasonable ranges and observe the resulting changes in the model output. Robustness testing goes further: we check whether the overall ranking or conclusions remain stable when reasonable changes are made to membership functions, rule weights, expert assessments, or benchmark values. For example, if the accessibility assessment increases by 10%, we can observe how the final brand value changes. If a relatively large change in an input produces only a small change in the output, the model is relatively robust with respect to that criterion. A comprehensive sensitivity and robustness analysis is an important next step in validating the model. The current model provides the framework for such testing, and the next stage is to systematically vary the key assumptions and quantify their impact on the final brand value.

4 Results and discussion

Based on the data and methodology described before, the fuzzy model produced the results presented in column A (see Table 1). The analysis yielded a brand strength score of 58,86. Accordingly, the resulting brand strength coefficient is 1,59.

The financial component of Ülemiste City's brand value cannot be disclosed, as it constitutes confidential business information. However, applying the coefficient of 1,59 to the financial baseline yields an estimate of the brand's monetary value within the proposed framework.

Column A illustrates the relative contribution of different components to overall brand strength. The results indicate that accessibility is the weakest dimension, while customers' perceived value of the campus is the strongest. This is reflected in behavioral and attitudinal loyalty indicators, including occupancy rates and Net Promoter Score, which together form the Brand Relationship dimension.

A key limitation of this model is that the results are not directly comparable across brands within the same category, as the outcomes depend on firm-specific targets. For example, if a company sets ambitious accessibility targets – such as cycling infrastructure or electric vehicle charging – and these targets are not fully achieved, the resulting score will be relatively low. However, under identical physical conditions, lower targets would produce a higher

score. This target dependence limits the model's usefulness for cross-brand comparison. To address this limitation, we developed an alternative model based primarily on customer evaluations (marked with * in Table B1), measured on standardized scales (e.g., satisfaction ratings) or as proportions (e.g., awareness levels). As an exception, occupancy rates were retained because they provide a consistent, behaviorally grounded indicator of loyalty. The results of this alternative specification are presented in column B. In this form, the resulting brand strength coefficient is comparable across brands, as the same evaluation criteria can be applied consistently within a category.

The results show that the brand strength coefficient in column B is higher than in column A. This suggests that the company's internal targets are more demanding than customers' evaluations. Most component scores increase under this specification, with the largest improvements observed in Accessibility and Brand Energy. The only component that remains stable is Brand Involvement, as it was already based on customer evaluations and occupancy rates in the initial model.

Overall, the two model specifications serve complementary purposes. The customer-based version (column B) is better suited for benchmarking and comparative analysis, as it reflects external perceptions of brand performance. Conversely, the target-based version (column A) is better suited for managerial decision-making, as it enables assessing how specific investments and service improvements affect brand value. Importantly, the comparison between the two versions provides additional managerial insight by revealing the gap between internal ambitions and customer perceptions. This gap can serve as a diagnostic tool, helping organizations calibrate strategic priorities and align development targets more closely with market expectations.

The proposed approach is potentially applicable not only to business campuses and territorial brands but also to other organizational and business contexts in which a brand's monetary value depends on a combination of objective results, stakeholder perceptions, and intangible effects. For instance, the model can be adapted for corporate brands, specific business units, product and service brands, and organizations for which relationships with multiple stakeholder groups are important. Depending on the context, the set of input indicators and linguistic rules can be modified without altering the overall logic of the fuzzy inference process.

For a corporate brand, for instance, the model might incorporate metrics related to reputation, trust among clients and partners, employer attractiveness, innovation activity, and financial stability. For a retail or service brand, the focus might shift to customer satisfaction and loyalty, perceived quality, willingness to pay a price premium, brand awareness, and the strength of customer relationships. In a B2B context, factors such as trust, reliability, relationship longevity, and the ability to attract and retain clients and partners may become significant. Thus, transferring the model to a different context primarily entails adapting the indicators, their threshold values, and the fuzzy rule base to the specific business environment, while the model's overall architecture remains intact.

However, the results of this study should not be interpreted as proof of the model's universal applicability. The empirical validation was based on a single case study; therefore, applying the approach to other industries and organizational contexts requires further validation, parameter calibration, and robustness testing.

There is no single objective "correct" value of a Business City's brand value against which the model output can be directly verified. Therefore, the validity of the result should be demonstrated through several forms of validation: expert validation, benchmark comparisons, sensitivity analyses, robustness testing, and, ideally, comparisons with independent assessments of other Business Cities.

For Ülemiste City, the result should be interpreted as a structured model-based assessment rather than as an objectively measured monetary truth. Its credibility comes from the consistency of the input data, expert assessments, benchmark information, logical rule base, and the stability of the output under reasonable changes in assumptions. We do not claim that the model produces the "true" brand value. We claim that it provides a transparent, systematic, and reproducible way of estimating brand value under uncertainty. The strongest validation would be an out-of-sample comparison: applying the same framework to several comparable Business Cities and comparing the model results with independent expert evaluations and observable performance indicators.

5 Conclusion

This study addresses a persistent challenge in brand management: the lack of transparent and operationalizable approaches for incorporating brand strength into monetary brand valuation. While financial valuation methods are relatively well established, integrating perceptual and behavioral dimensions remains methodologically underdeveloped. This study develops a fuzzy approach for modeling the brand strength component within a monetary valuation framework. The proposed approach demonstrates how heterogeneous inputs – ranging from objective performance indicators to subjective, perception-based measures – can be systematically integrated into a coherent and interpretable model. By formalizing expert knowledge through linguistic rules and combining it with empirical data, the model offers an alternative to traditional linear and index-based valuation methods.

A key contribution of the study lies in distinguishing between two complementary model specifications. The

first, target-based approach reflects internal performance against strategic objectives and is particularly suited to managerial decision-making. The second, customer-based specification relies on standardized perception measures, enabling comparability across brands within the same category. This distinction addresses a tension in brand valuation between managerial relevance and cross-sectional comparability, and provides a practical pathway to resolve it.

The empirical application to a business campus demonstrates the approach's feasibility and highlights how different dimensions of brand strength contribute to overall brand value. Importantly, the comparison of model specifications reveals the gap between internal targets and external perceptions, offering a diagnostic perspective to align strategic priorities with stakeholder expectations.

The study did not limit itself to modeling the brand strength component alone; it also applied the full valuation framework in practice, resulting in the estimation of the monetary value of the case brand. However, the financial component and the resulting value cannot be disclosed due to confidentiality constraints.

From a theoretical perspective, the study contributes to the brand valuation literature by operationalizing the brand strength component as a structured, multi-dimensional construct that can be formally modeled and empirically estimated. Broadly, it bridges the gap between financial valuation approaches and brand equity research by providing a method for integrating perceptual variables into monetary valuation frameworks.

From a managerial perspective, the proposed approach offers a practical tool for evaluating brand performance, identifying priority areas for improvement, and assessing the impact of strategic decisions on brand value. Its flexibility makes it applicable across different branding contexts, including corporate and place brands, while maintaining transparency and interpretability.

The main scientific contribution of the study is the development of an interpretable fuzzy-logic-based methodological approach for operationalizing Brand Strength as a component of monetary brand valuation. The approach provides a structured mechanism for integrating heterogeneous perceptual, objective, and expert-based information into a single quantitative assessment. A further contribution is the distinction between goal-oriented and customer-oriented model specifications, which separates the purpose of internal brand management from the requirement of cross-brand comparability. The empirical application to Ülemiste City demonstrates how the proposed approach can be operationalized and provides evidence of its practical feasibility, while also illustrating the need for further validation across brands, industries, and geographical contexts.

The proposed approach has cross-company generalisability, meaning the model can be applied to other Business Cities or comparable business environments without fundamentally changing its structure. The core framework — the criteria, linguistic scales, fuzzy inference approach, and evaluation logic — can remain the same, while the input data, expert assessments, benchmark values, and, if necessary, some membership-function parameters and rules can be adapted to the specific context. At this stage, generalisability is a design property of the model rather than a fully empirically validated result. The model was developed using Ülemiste City as a case study, but its architecture was deliberately designed to be transferable to other comparable Business Cities. Full empirical validation across multiple Business Cities is the next step. The methodology and the model (implemented in MATLAB) are transferable, whereas the input parameters for a newly studied object are context-dependent.

Nevertheless, several limitations should be acknowledged. First, the model relies on the quality of input data and the specification of expert rules, which may introduce subjectivity. Second, the empirical application is based on a single case, which limits generalizability and calls for further testing across different contexts. Third, the assumed upper bound on the brand strength multiplier is theoretically informed but requires further empirical validation.

Future research should focus on validating the proposed framework across industries and geographic contexts, refining parameter calibration, and exploring hybrid approaches that combine fuzzy modeling with data-driven techniques. Such developments would further enhance the robustness and applicability of monetary brand valuation models.

References

Aaker, D. (1991). *Managing Brand Equity: Capitalizing on the value of a brand name.* Free Press, New York. https://doi.org/10.1016/0148-2963(94)90009-4

Aaker, D. (1996). *Building Strong Brands*, Free Press, New York. https://www.academia.edu/34383247/David_A_Aaker_Building_Strong_Brands

Amerian, M. (2021). Toward a conceptual model for public space assessment with focus on the right to the city discourse using the fuzzy-Delphi and DEMATEL methods. *Journal of Urban and Regional Analysis*, *13*(2), 233-256. https://doi.org/10.37043/JURA.2021.13.2.3

Aminu, S., & Ahmad, N. (2018). An evaluation of the effects of brand equity on consumer willingness to pay price Premium. *International Journal of Marketing Research Innovation, 2*(1), 64-72. https://doi.org/10.46281/ijmri.v2i1.106

Anholt, S. (2006). The Anholt-GMI City Brands Index: How the world sees the world's cities. *Place Branding and Public Diplomacy, 2*, 18–31. https://doi.org/10.1057/palgrave.pb.5990042

Baron, T., & Harima, A. (2019). The role of diaspora entrepreneurs in start-up ecosystem development: A Berlin case study. *International Journal of Entrepreneurship and Small Business, 36*(1), 74–92. https://doi.org/10.1504/IJESB.2019.096968

Benedek, I. (2017). Measuring place brand equity: A review of current models. *Journal of Media Research, 10*, 42–57. https://doi.org/10.24193/jmr.27.5

Berry, L. (2000). Cultivating service brand equity. *Journal of the Academy of Marketing Science, 28*(1), 128–137. https://doi.org/10.1177/0092070300281012

Bhaskaran, R., Sujit, K., & Waheed, K. (2023). Linkage between brand value and firm performance: An empirical examination using fuzzy set qualitative comparative analysis. *SAGE Open, 13*(3). https://doi.org/10.1177/21582440231192135

Blank, T. (2021). When incubator resources are crucial: Survival chances of student startups operating in an academic incubator. *The Journal of Technology Transfer, 46*(6), 1845–1868. https://doi.org/10.1007/s10961-020-09831-4

Brand Finance. (2026). *Global 500 2026: NVIDIA's brand is now more valuable than Facebook and Walmart*. https://brandirectory.com/reports/global/2026

Burmann, C., Jost-Benz, M., & Riley, N. (2009). Towards an identity-based brand equity model. *Journal of Business Research, 62*(3), 390–397. https://doi.org/10.1016/j.jbusres.2008.06.009

Carroll, B., & Ahuvia, A. (2006). Some antecedents and outcomes of brand love. *Marketing Letters, 17*(2), 79–89. https://doi.org/10.1007/s11002-006-4219-2

Chou, J. (2017). A fuzzy-based sustainability assessment approach for promoting sustainable urban mobility. In *Proceedings of the 2017 International Conference on Organizational Innovation (ICOI 2017)* (pp. 312–317). https://doi.org/10.2991/icoi-17.2017.53

Christodoulides, G., & de Chernatony, L. (2010). Consumer-based brand equity conceptualization and measurement. *International Journal of Market Research, 52*(1), 43–66. https://doi.org/10.2501/S1470785310201053

Cristea, A., & Munteanu, C. (2022). A holistic perspective on brand equity measurement methods. *Business Management Dynamics, 11*(7), 58–82. https://www.researchgate.net/publication/362531078_A_holistic_perspective_on_brand_equity_measurement_methods

Cukier, D., Kon, F., & Lyons, T. (2016). Software startup ecosystems evolution: The New York City case study. *Proceedings of the 2nd International Workshop on Software Startups*. https://doi.org/10.1109/ICE/ITMC39735.2016.9026150

de Chernatony, L., McDonald, M., & Wallace, E. (2011). *Creating powerful brands*. Butterworth-Heinemann. https://doi.org/10.1057/bm.2011.14

Dinçer, H., Bozaykut-Buk, T., Emir, Ş., Yuksel, S., & Ashill, N. (2020). Using the fuzzy multicriteria decision-making approach to evaluate brand equity: A study of privatized firms. *Journal of Product & Brand Management, 29*(3), 335–354. https://doi.org/10.1108/JPBM-09-2018-2037

Dorokhova, L., Dorokhov, O., & Kuusik, A. (2024). Fuzzy methods in marketing research: Brief literature review. *Studies in Business and Economics, 19*(3), 67–86. https://doi.org/10.2478/sbe-2024-0044

Duan, Q., Liu, B. S., & Wu, F. (2017). Research on brand valuation models based on the triangular fuzzy matrix game. *Vibroengineering Procedia, 13*, 255–260. https://doi.org/10.21595/vp.2017.18927

Duman, T., Ozbal, O., & Duerod, M. (2018). The role of affective factors on brand resonance: Measuring customer-based brand equity for the Sarajevo brand. *Journal of Destination Marketing & Management, 8*, 359–372. https://doi.org/10.1016/j.jdmm.2017.08.001

Erdogan, M., Bilisik, Ö., & Kaya, I. (2018). A new fuzzy decision-making procedure to prioritization of the brand city candidates for Turkey. *Journal of Multiple-Valued Logic and Soft Computing, 30*(1), 1–28. https://www.researchgate.net/publication/323514565_A_new_fuzzy_decision-making_procedure_to_prioritization_of_the_brand_city_candidates_for_Turkey

Fatma, M., & Khan, I. (2024). Brand authenticity and consumers' willingness to pay a premium price (WPP): The mediating role of brand identification. *Journal of Brand Management, 31*, 469–481. https://doi.org/10.1057/s41262-024-00353-0

Foroudi, P., Jin, Z., Gupta, S., Foroudi, M., & Kitchen, P. (2018). Perceptional components of brand equity: Configuring the symmetrical and asymmetrical paths to brand loyalty and brand purchase intention. *Journal of Business Research, 89*, 462–474. https://doi.org/10.1016/j.jbusres.2018.01.031

Fuzzy logic. (2021). *Stanford Encyclopedia of Philosophy*. https://plato.stanford.edu/entries/logicfuzzy/

Gauthier, J., Penzel, M., & Stangler, D. (2020). *Global startup ecosystem report 2020*. Startup Genome. https://www.scribd.com/document/486778754/Global-Startup-Ecosystem-Report-GSER-2020-pdf

Guo, Y. (2017). Luxury brand value evaluation method based on fuzzy comprehensive evaluation. In *2017 International Conference on Robots & Intelligent System (ICRIS)* (pp. 194–197). https://doi.org/10.1109/ICRIS.2017.55

Haig, R. (2021). *How we value the brands in our annual rankings*. Brand Finance. https://brandfinance.com/insights/methodology-brands-annual-rankings

Haines, T. (2016). Developing a startup and innovation ecosystem in regional Australia. *Technology Innovation Management Review, 6*(6), 9–18. https://doi.org/10.22215/timreview/994

Hair, J., Hult, T., Ringle, C., & Sarstedt, M. (2021). *A primer on partial least squares structural equation mode-*

ling (PLS-SEM) (3rd ed.). SAGE Publications. https://www.researchgate.net/publication/354331182_A_Primer_on_Partial_Least_Squares_Structural_Equation_Modeling_PLS-SEM

Hegner, S., Fetscherin, M., & van Delzen, M. (2017). Determinants and outcomes of brand hate. *Journal of Product & Brand Management, 26*(1), 13–25. https://doi.org/10.1108/JPBM-01-2016-1070

Hereźniak, M., Florek, M., & Augustyn, A. (2018). On measuring place brand effectiveness: Between theoretical developments and empirical findings. *Economics and Sociology, 11*(2), 36–51. https://doi.org/10.14254/2071-789X.2018/11-2/3

Hitchner, J. R. (2006). *Financial valuation: Applications and models* (2nd ed.). John Wiley & Sons. https://books.google.ee/books/about/Financial_Valuation.html?hl=es&id=nhKotwEACAAJ&redir_esc=y

Interbrand. (2025). *Best global brands 2025*. https://interbrand.com/best-global-brands/global/

Interbrand. (n.d.). *Brand valuation: A versatile strategic tool for business*. https://d338ucc43w64ir.cloudfront.net/uploads/2025/10/05164451/IB-Brand-Valuation_220608.pdf

International Organization for Standardization. (2010). *ISO 10668: Brand valuation—Requirements for monetary brand valuation*. https://www.iso.org/standard/46032.html

Jacobsen, B. P. (2010). Urban place brands and the location of creative industries: A model for measuring place-brand equity. *Urban Research & Practice, 3*(3), 275–298. https://doi.org/10.1080/17535069.2010.524419

Kantar. (2025). *Kantar BrandZ 2025 most valuable global brands*. https://www.kantar.com/campaigns/brandz/global

Kantar. (n.d.). *BrandZ methodology*. https://www.kantar.com/campaigns/brandz/methodology

Kapferer, J. N. (2012). *The new strategic brand management: Advanced insights and strategic thinking* (5th ed.). Kogan Page.

Keller, K. (1993). Conceptualizing, measuring, and managing customer-based brand equity. *Journal of Marketing, 57*(1), 1–22. https://doi.org/10.1177/002224299305700101

Keller, K. (2013). *Strategic brand management: Building, measuring and managing brand equity* (4th ed.). Pearson. https://books.google.ee/books/about/Strategic_Brand_Management.html?id=g8haMAEACAAJ&redir_esc=y

Keller, K. (2001). *Building customer-based brand equity: A blueprint for creating strong brands*. Marketing Science Institute. (Report No. 01-107). https://msi.org/working-paper/building-customerbased-brand-equity-a-blueprint-for-creating-strong-brands/

Keller, K.(2020). *Strategic Brand Management: Building, Measuring and Managing Brand Equity* (5th Global ed.). Pearson. https://www.pearson.com/nl/en_NL/higher-education/subject-catalogue/marketing/keller-strategic-brandmanagement-5e.html

Kenney, M., & Mowery, D. (2014). *Public universities and regional growth: Insights from the University of California*. Stanford Business Books. https://doi.org/10.20396/rbi.v15i1.8649126

Kimpakorn, N., & Tocquer, G. (2010). Service brand equity and employee brand commitment. *Journal of Services Marketing, 24*(5), 378–388. https://doi.org/10.1108/08876041011060486

Kusum, L., Donald, R., & Scott, A. (2003). Revenue premium as an outcome measure of bränd equity. *Journal of Marketing, 67*(4), 1–17. https://doi.org/10.1509/jmkg.67.4.1.18688

Lee, M., Motion, J., & Conroy, D. (2009). Anti-consumption and brand avoidance. *Journal of Business Research, 62*(2), 169–180. https://doi.org/10.1016/j.jbusres.2008.01.024

Leite, L. (2024). Brand valuation: How convergent (or divergent) are global brand rankings and how correlated is brand value to enterprise value? *Journal of Marketing Analytics, 12*, 375–389. https://doi.org/10.1057/s41270-022-00201-7

Lucarelli, A., & Berg, P. (2011). City branding: A state-of-the-art review of the research domain. *Journal of Place Management and Development, 4*(1), 9–27. https://doi.org/10.1108/17538331111117133

Magni, C., Malagoli, S., & Mastroleo, G. (2006). An alternative approach to firms' evaluation: Expert systems and fuzzy logic. *International Journal of Information Technology and Decision Making, 5*(1), 195–225. https://doi.org/10.1142/S0219622006001812

Malagoli, S., Magni, C., & Mastroleo, G. (2007). The use of fuzzy logic and expert systems for rating and pricing firms: A new perspective on valuation. *Managerial Finance*, *33*(11), 836-852. https://doi.org/10.1108/03074350710823818

Mard, M., Hitchner, J., & Hyden, S. (2007). *Valuation for financial reporting: Fair value measurement and reporting, intangible assets, goodwill and impairment*. John Wiley & Sons. https://books.google.ee/books/about/Valuation_for_Financial_Reporting.html?hl=zh-TW&id=6AYvxVFNl0UC&redir_esc=y

Mashiah, I. (2024). All we need is a Silicon Valley: Tech place as a strategic branding tool. *Place Branding and Public Diplomacy, 21*(2), 287–297. https://doi.org/10.1057/s41254-024-00389-8

Mellen, C., & Evens, F. (2010). *Valuation for M&A: Building value in private companies* (2nd ed.). John Wiley & Sons. https://books.google.ee/books/about/Valuation_for_M_A.html?id=ham51GIA0p0C&redir_esc=y

Mochales, G., & Blanch, J. (2022). Unlocking the potential

of CSR: An explanatory model to determine the strategic character of CSR activities. *Journal of Business Research, 140*, 310–323. https://doi.org/10.1016/j.jbusres.2021.11.002

Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing, 58*(3), 20–38. https://doi.org/10.2307/1252308

Oh, T., Keller, K., Neslin, S., Reibstein, D., & Lehmann, D. (2020). The past, present, and future of brand research. *Marketing Letters, 31*, 151–162. https://doi.org/10.1007/s11002-020-09524-w

Oliver, R. (1999). Whence consumer loyalty? *Journal of Marketing, 63*(Suppl. 1), 33–44. https://doi.org/10.2307/1252099

Piwowar-Sulej, K., Sołtysik, M., Jarosz, S., & Pukała, R. (2023). The Linkage between Renewable Energy and Project Management: What Do We Already Know, and What Are the Future Directions of Research? *Energies, 16*(12), 4609. https://doi.org/10.3390/en16124609

Pukala, R. (2021). Impact of financial risk on the operation of start-ups. *Access to Science, Business, Innovation in Digital Economy*, *2*(1): 40-49. https://doi.org/10.46656/access.2021.2.1(4)

Rahman, R. (2018). Building brand awareness: The role of celebrity endorsement in advertisements. *Journal of Global Scholars of Marketing Science, 28*(4), 363–384. https://doi.org/10.1080/21639159.2018.1509366

Reilly, R., & Dandekar, M. (1997). Valuation of intangible contract rights. *CPA Journal, 67*(6), 74–75. http://archives.cpajournal.com/97main_index.htm

Richards, G. (2017). From place branding to placemaking: The role of events. *International Journal of Event and Festival Management, 8*(1), 8–23. https://doi.org/10.1108/IJEFM-09-2016-0063

Rindell, A., Santos, F., & de Lima, A. (2015). Two sides of a coin: Connecting corporate brand heritage to consumers' corporate image heritage. *Journal of Brand Management, 22*, 467–484. https://doi.org/10.1057/bm.2015.20

Roblek, V., Bach, M., Meško, M., & Bertoncel, T. (2020). Best practices of the social innovations in the framework of the e-government evolution. *Amfiteatru Economic, 22*(53), 275–302. https://doi.org/10.24818/EA/2019/53/275

Roblek, V., & Meško, M. (2020). Smart city knowledge management: Holistic review and the analysis of the urban knowledge management. In *Proceedings of the 21st Annual International Conference on Digital Government Research* (pp. 52–60). https://doi.org/10.1145/3396956.3398263

Saffron Brand Consultants. (2019). *Saffron City Brand Barometer 2019: City case studies*. https://citybrandbarometer.saffron-consultants.com/

Sahin, I. (2021). Brand valuation and contemporary methods used in determining brand value: A financial perspective. In U. Hacioglu & T. Aksoy (Eds.), *Financial ecosystem and strategy in the digital era*. Springer. https://doi.org/10.1007/978-3-030-72624-9_14

Sakas, D., Kamperos, I., Reklitis, D., Giannakopoulos, N., Nasiopoulos, D., Terzi, M., & Kanellos, N. (2022). The effectiveness of centralized payment network advertisements on digital branding during the COVID-19 crisis. *Sustainability, 14*(6). https://doi.org/10.3390/su14063616

Salinas, G., & Ambler, T. (2009). A taxonomy of brand valuation practice: Methodologies and purposes. *Journal of Brand Management, 17*, 39–61. https://doi.org/10.1057/bm.2009.14

Scott, G. (2023). *Fuzzy logic: Definition, meaning, examples, and history*. Investopedia. https://www.investopedia.com/terms/f/fuzzy-logic.asp

Sokołowska, E., Pawlak, K., Hajduk, G., & Dziadkiewicz, A. (2022). City brand equity, a marketing perspective. *Cities, 130*. https://doi.org/10.1016/j.cities.2022.103936

Stojanovic, N. (2019). Application of fuzzy logic in modeling market brand value. *American Journal of Mathematical and Computer Modelling, 4*(1), 1. https://doi.org/10.11648/j.ajmcm.20190401.11

Stokburger, N., Ratneshwar, S., & Sen, S. (2012). Drivers of consumer–brand identification. *International Journal of Research in Marketing, 29*(4), 406–418. https://doi.org/10.1016/j.ijresmar.2012.06.001

Torres, P., Augusto, M., & Godinho, P. (2018). Do high brand equity and very high brand equity require different conditions? An empirical study using fsQCA. *International Journal of Economics and Business Research, 16*(2), 263–279. https://doi.org/10.1504/IJEBR.2018.094021

Tripathi, N., Seppänen, P., Boominathan, G., Oivo, M., & Liukkunen, K. (2019). Insights into startup ecosystems through exploration of multi-vocal literature. *Information and Software Technology, 105*, 56–77. https://doi.org/10.1016/j.infsof.2018.08.005

Tuominen, P. (1999). Managing brand equity. *Finnish Journal of Business Economics, 1*(99), 65–100. https://www.semanticscholar.org/paper/Managing-Brand-Equity-Tuominen/5a49dfc627a8ce55369687bc53c17b06c84e5252

Wang, D., & Yu, T. (2015). A fuzzy logic approach to modeling brand value: Evidence from Taiwan's banking industry. In D. Palacios-Marqués, D. Ribeiro Soriano, & K. Huarng (Eds.), *New information and communication technologies for knowledge management in organizations*. Springer. https://link.springer.com/chapter/10.1007/978-3-319-22204-2_4

Wang, T., & Huang, Y. (2021). How to choose the correct branding? Application of fuzzy VIKOR on consumers purchasing the luxury brand. In *Proceedings of the 6th Annual International Conference on Social*

Science and Development (pp. 618–623). https://doi.org/10.2991/assehr.k.210121.124

Wang, T., Thai, T., Ly, P., & Chi, T. (2021). Turning social endorsement into bränd passion. *Journal of Business Research, 126*, 429–439. https://doi.org/10.1016/j.jbusres.2021.01.011

Wedel, M., & Kannan, P. (2016). Marketing analytics for data-rich environments. *Journal of Marketing, 80*, 97–121. https://doi.org/10.1509/jm.15.0413

Y&R. (n.d.). *The story of the Y&R BrandAsset Valuator investigation*. https://ruby.fgcu.edu/courses/tdugas/ids3332/

Zadeh, L. (1965). Fuzzy sets. *Information and Control, 8*, 338–353. https://doi.org/10.1016/S0019-9958(65)90241-X

Andres Kuusik is a professor in the chair of Marketing at the School of Economics and Business Administration at the University of Tartu, Estonia. He specializes in consumer behavior and customer loyalty. His research fields include culture brand management, creating and measuring brand value, place branding, customer loyalty, neuromarketing, and the commercialization of research.

Kristian Pentus is the head of the Marketing chair at the School of Economics and Business Administration at the University of Tartu, Estonia. His research interests include neuromarketing, consumer behavior, eye-tracking research, emotion measurement research, package design research, and artificial intelligence in marketing.

Kertu Lääts is associate professor of accounting, the head of the School of Economics and Business Administration at the University of Tartu, Estonia. Her research interests include management accounting and control, accounting information systems, financial analysis, and performance management.

Liudmyla Dorokhova is a visiting professor in the chair of Marketing at the School of Economics and Business Administration at the University of Tartu, Estonia. Her research interests include consumer behavior and choice, customer service, and decision-making models.

Oleksandr Dorokhov is a visiting professor in the chair of Public Economics and Policy at the School of Economics and Business Administration at the University of Tartu, Estonia. His research focuses on multicriteria decision support systems, computer modeling in economics, fuzzy logic, and modeling the functioning of startups and entrepreneurial ecosystems.

Modeliranje moči znamke pri denarnem vrednotenju znamke z uporabo mehke logike: primer tržne znamke območja

Namen: Denarno vrednotenje znamke ostaja pomemben izziv na področju upravljanja znamk zaradi pomanjkanja preglednih pristopov za operacionalizacijo moči znamke. Čeprav so metode vrednotenja, ki temeljijo na finančnih kazalnikih, dobro uveljavljene, je vključevanje zaznavnih in vedenjskih dimenzij v modele denarnega vrednotenja še vedno omejeno. Namen raziskave je razviti in preizkusiti metodološki pristop za modeliranje moči znamke v okviru denarnega vrednotenja znamke. Predlagani pristop temelji na interpretabilnem modelu sklepanja z mehko logiko, ki združuje zaznavne podatke, objektivne kazalnike in znanje strokovnjakov. Kot empirični primer za prikaz in preverjanje praktične uporabnosti pristopa je uporabljena znamka kraja Ülemiste City v Talinu v Estoniji.
Metodologija/pristop: Raziskava predlaga model mehke logike za ocenjevanje moči znamke v procesu denarnega vrednotenja znamke. Pristop združuje heterogene vire podatkov, vključno z anketnimi ocenami deležnikov, objektivnimi kazalniki in znanjem strokovnjakov, v transparenten model, temelječ na pravilih. Delovanje modela je empirično prikazano na primeru znamke kraja Ülemiste City.
Ugotovitve: Rezultati kažejo, da predlagani model ustvarja konsistentne in interpretabilne koeficiente moči znamke ter podpira dva komplementarna načina uporabe: interno, ciljno usmerjeno upravljanje znamke in primerljivost med znamkami. Ugotovitve potrjujejo, da mehka logika predstavlja učinkovit mehanizem za povezovanje različnih virov informacij o znamki v enoten okvir denarnega vrednotenja znamke.
Izvirnost/vrednost: Raziskava prispeva k razvoju področja upravljanja znamk z uvedbo pregledne metode za vključevanje moči znamke v denarno vrednotenje znamke ter s povezovanjem finančnih kazalnikov z ocenami, ki temeljijo na zaznavah deležnikov. Ker na področju vrednotenja znamk ne obstaja splošno sprejeta in javno dostopna metoda za izračun njihove denarne vrednosti, predlagani okvir prinaša tako teoretično kot praktično vrednost. Predstavlja prilagodljivo in diagnostično uporabno orodje za vrednotenje znamk ter hkrati izboljšuje razumljivost in interpretabilnost ocen njihove denarne vrednosti.

Ključne besede: *Vrednost znamke, Moč znamke, Vrednotenje znamke, Mehka logika, Znamka kraja*

Appendix A

Table A1: Survey questions

Please rate on a 10-point scale how true the following statements are in your opinion:
1.1. The physical environment of Ülemiste City campus is aesthetically pleasing to me. 1.2. The physical environment of Ülemiste City (green areas, playgrounds, play corners, etc.) provides good opportunities for balancing work and family life. 1.3. Employees of my company spend time in Ülemiste City outside of working hours (restaurants, sports clubs, events, etc.). 1.4. Being located in Ülemiste City enables my company's employees to live and behave more healthily.
2.1. Ülemiste City stands out from other business campuses in Tallinn. 2.2. Please name up to three factors that, in your opinion, differentiate Ülemiste City from other business campuses. 2.3. How important are the differentiating factors mentioned above when choosing your company's location? 2.4. It is visually apparent to me when I have arrived at Ülemiste City (it looks different from other business areas).
3.1. Ülemiste City is environmentally friendly. 3.2. The management of Ülemiste City is socially responsible.
4.1. Being located in Ülemiste City adds prestige to my company. 4.2. In Ülemiste City, I can express my company's core values. 4.3. The story of Ülemiste City (historical buildings, the vision of Pärnits, etc.) adds uniqueness and value to the campus.
5.1. Being located in Ülemiste City enables my company to more easily carry out necessary research and development activities. 5.2. I actively collaborate with other companies located in Ülemiste City. 5.3. Rent and other fees in Ülemiste City are aligned with the services and opportunities provided by the campus. 5.4. The location of Ülemiste City is advantageous given the specifics of my company.
6.1. Thanks to the networks and events in Ülemiste City, my company can more easily address various challenges. 6.2. Activities carried out within the Ülemiste City community fund create value for my company. 6.3. Being located in Ülemiste City enables my company to more easily find and recruit (including international) talent. 6.4. Ülemiste City as a community is valuable to me.
7.1. I feel that my company is involved in the development of Ülemiste City. 7.2. I have good opportunities to provide feedback to Ülemiste City. 7.3. My feedback is taken into account by the management of Ülemiste City. 7.4. Ülemiste City responds quickly to changes in the external environment (pandemic, war, economic challenges, AI, etc.).
8.1. I see my company as a member of the Ülemiste City community also in five years' time. 8.2. How likely are you to recommend Ülemiste City as a location for establishing or relocating a company to your friends and business partners? 8.3. Name of your company/organization 8.4. Your position/title in the company

Appendix B

Table B1: Input parameters, units of measure, max, and test values for MATLAB model

Vars	input variable	units of measure	max value	ÜC value	Branch
V1	Open workspaces	places	260	190	Work and Living Environment Intermediate result IR1
V2	Gross salary	€	4010	2237	
V3	Rent and benefits are congruent*	scale (0-10)	10	7,16	
W1	The number of inhabitants in the town	persons	2010	900	
V4	Possibilities to merge work and personal life*	scale (0-10)	10	7,79	
V5	My workers also spent free time in ÜC*	scale (0-10)	10	5,24	
W2	Possibilities to behave healthily*	scale (0-10)	10	7,55	
V6	I like the aesthetics of the ÜC environment*	scale (0-10)	10	8,98	
V7	Outdoor recreation areas	m^2	2110	1807	
V8	Satisfaction with the external environment*	scale (0-100)	100	81	
W3	Satisfaction with B2C*	scale (0-100)	100	83	
V9	Satisfaction with security*	scale (0-100)	100	87	
V10	Internationals satisfaction*	scale (0-100)	100	13,4	
V11	International tolerance satisfaction*	scale (0-100)	100	87	
V12	Satisfaction with accessibility*	scale (0-100)	100	81	Accessibility Intermediate result IR2
V13	Cycle paths per area	km/km^2	13	0	
V14	Footpaths per area	km/km^2	14	5,09	
V15	Number of parking spaces/in	numbers/in	11	0,28	
V16	Peak hour occupancy	%	95	76	
V17	Number of cars in the town per day/in	numbers/in	10	4	
W4	Number of means of transport per 1000 people	numbers/1000	20	7	
V18	Number of public transport stops	$numbers/km^2$	27	11	
V19	Frequency (several trips per day) every 20-30 min	minutes/per day	510	415	
V20	Time taken (out of 10 points in Tallinn)	minutes	30	25	
W5	Number of networks	number	30	9	Community Intermediate result IR3
V21	The community helps me*	scale (0-10)	10	6,52	
V22	The Community is valuable*	scale (0-10)	10	7,64	
V23	Number of events per year	number	210	150	
V24	Number of visitors per year	number	40010	33000	
V25	International workers proportion	%	4510	1430	
V26	I can hire talents*	scale (0-10)	10	5,9	
W6	The community fund is helpful*	scale (0-10)	10	6,16	

Table B1: Input parameters, units of measure, max, and test values for MATLAB model (continues)

V27	Share of technology-oriented production/services	%	80	47	Economic potential Intermediate result IR4
V28	Number of startups	number	60	16	
V29	R&D possibilities	scale (10)	10	6,53	
V30	R&D expenditure per GDP	% turnover	15	4,1	
V31	Share of cooperating companies	%	80	50	
V32	I do cooperate with others*	scale (0-10)	10	6,38	
W7	Share of the town's employees	%	62	29	
V33	Workers nr	number	20010	10614	
V34	Residents nr	number	2010	900	
V35	Share of labor taxes in Estonian tax revenue	%	15	3	
V36	Share of VAT in Estonian tax revenue	%	15	2,4	
V37	New jobs created/ all ÜC jobs	%	15	4,6	
V38	Job creation trend compared to Estonia	%	15	**2**	
V39	Growth of added value per year	%	25	23	
V40	Sales revenue per employee	€	200010	165000	
V41	Turnover growth per year	%	20	6,6	
V42	Export growth per year	%	30	7,9	
V43	Share of exports in sales revenue	%	80	51	
W8	Green area per capita	m^2/per capita	60	3,7	Brand energy Intermediate result IR5
V44	The share of LEED buildings in gross office space	%	110	87,4	
V45	Digital bike racks	number	610	157	
V46	Charging points for electric cars	number	693	15	
V47	Outdoor recreation areas	m^2	2110	1807	
V48	Satisfaction with the external environment*	scale (0-100)	100	81	
V49	Amount of waste per person	kg/in	67	64	
V50	Collection of waste by type	%	80	11	
V51	ÜCis eco-friendly*	scale (0-10)	10	8,69	
V52	Management is socially responsible*	scale (0-10)	10	8,74	
V53	Differentiation*	scale (0-10)	10	8,91	
V54	Relevancy*	scale (0-10)	10	8,44	
V55	Visual differentiation*	scale (0-10)	10	8,16	
W9	ÜC awareness*	%	100	81	Brand involvement Intermediate result IR6
V56	ÜC reputation*	scale (0-10)	10	7,3	
V57	ÜC adds dignity to my company*	scale (0-10)	10	8,66	
V58	I can show our values*	scale (0-10)	10	8,07	
V59	The ÜC story is valuable*	scale (0-10)	10	8,52	
V60	Involvement*	scale (0-10)	10	7,34	
V61	Feedback channels*	scale (0-10)	10	7,79	
V62	ÜC is taking into account my feedback*	scale (0-10)	10	7,41	
V63	Agility*	scale (0-10)	10	7,53	
V64	Behavioural loyalty*	scale (0-10)	10	8,55	
V65	Attitudinal loyalty*	scale (0-10)	10	8,87	
W10	Net promoter score*	%	100	76,8	

Source: Authors' own work (input variables obtained based on customer evaluations are indicated with *)

Appendix B

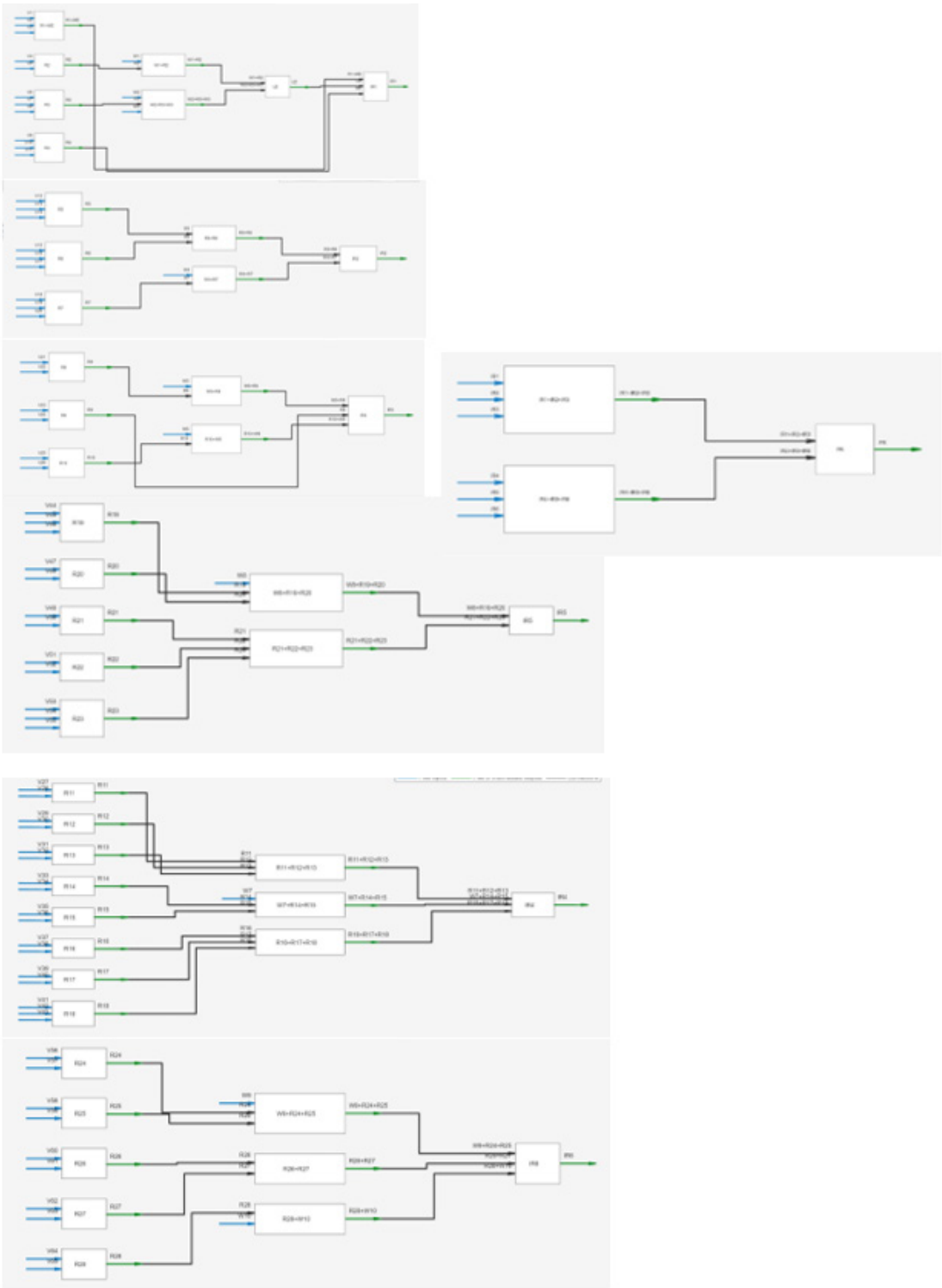


Figure B1: The tree for the calculation of the results in the MATLAB model
Source: Authors' own model

Appendix B

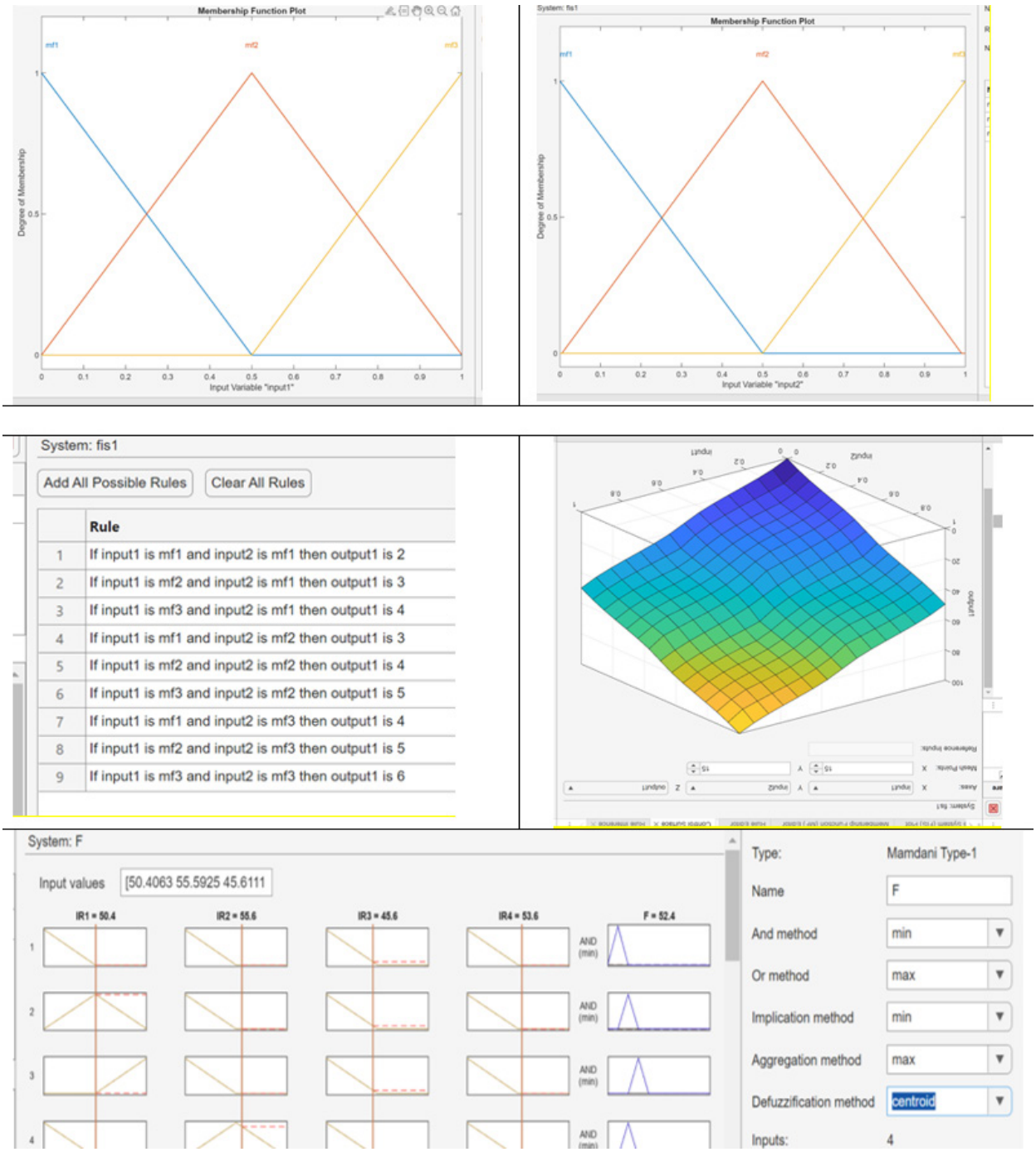


Figure B2: Examples in graphical form of the implementation of the Fuzzy Inference blocks and process in the model, fragments
Source: Authors' own model