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THE APPLICATION OF FRACTALISATION IN MARKETING: A FRAMEWORK FOR PERSONALISED THERAPEUTIC STRATEGIES

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Purpose: The objective of this article is to introduce the concept of @fractalisation as an innovative approach to the personalisation of medical services within therapeutic organisations. The authors aim to demonstrate how contemporary information technologies – such as the Internet of Things, artificial intelligence, and data analytics systems – can transform medical data into personalised insights that support accurate therapeutic decision-making and enhance treatment quality.
Design/methodology/approach: This is a conceptual and model-based article, grounded in a review of the literature and the development of a three-stage @fractalisation process for patients. This process integrates both quantitative data (e.g. laboratory test results) and qualitative data (e.g. social opinions, levels of patient trust). The approach is based on the abstraction and aggregation of patients' "hidden" characteristics, supported by IT tools for data analysis and visualisation.
Findings: The article presents a @fractalisation model that enables the classification of patients into fractal sets based on similarities in test results and behavioural traits. The model facilitates the evaluation of therapeutic effectiveness, identification of best medical practices, and dynamic monitoring of health status changes. The concept of @prediction is introduced as a tool for forecasting health behaviours, alongside "defractalisation" as a method for identifying patients with stable health conditions.
Research limitations/implications: The proposed model requires further empirical validation under real clinical conditions. Limitations may include the availability and quality of medical data, as well as the need for data standardisation. The authors advocate for the development of dynamic fractalisation algorithms and the inclusion of psychological and social factors in future research. It is also essential to examine the impact of prediction on therapeutic decisions and patient behaviours.
Practical implications: The application of @fractalisation has the potential to significantly improve diagnostic and therapeutic processes by enabling faster decision-making and leveraging the experiences of other clinicians. The model may be implemented in e-health systems (e.g. e-Patient, mojeIKP), automating patient communication and supporting therapy personalisation. Additionally, it may contribute to reducing treatment costs through early disease detection and the use of proven therapeutic methods.

Social implications: The implementation of @fractalisation may enhance the accessibility and quality of healthcare, improve treatment outcomes, and foster public trust in medical institutions. Prediction can support the development of positive health behaviours, increase patient awareness, and promote responsible use of medical services. The model may also inform health policy and support the advancement of digital transformation in healthcare.
Originality/value: This article offers a novel contribution by proposing the concept of @fractalisation as an innovative tool for supporting therapeutic decision-making. The integration of quantitative and qualitative research, the use of visualisation and prediction, and the dynamic assignment of patients to fractal sets represent a pioneering approach to the personalisation of medical services. The publication is intended for healthcare managers, medical practitioners, and researchers engaged in the digitalisation of healthcare.
Keywords: @fractalisation, therapy personalisation, artificial intelligence, Internet of Things, digital health.
Category of the paper: methodological paper.

1. Introduction

Contemporary information technologies compel nearly all manufacturing and service enterprises to adapt traditional forms of stakeholder communication to the requirements of the Internet. Information conveyed through computer programmes now constitutes the foundation of knowledge creation, enabling managers to reduce uncertainty in making accurate decisions (Nowicki, 2005).

The growing expectations of stakeholders, coupled with increasing societal awareness, mean that possessing information derived from information technologies has become a prerequisite for achieving competitive advantage within a given industry (Mruk, 2002). A new business environment is emerging, in which actions based on modern IT solutions – enhancing productivity and operational efficiency – serve as a fundamental criterion determining the success or failure of undertaken initiatives (Sztucki, 1998).

Newly emerging trends represent objective and long-term directions in broadly understood consumer preferences, choices, and behaviours. These trends are a consequence of changes in the market environment occurring across socio-political, cultural, demographic, legal, and technological dimensions (Zalega, 2016).

It is important to emphasise that the Internet also facilitates easy access to a unified target group of customers (Małachowski, 2000). This leads to a shift in marketing efforts – from addressing customer needs to focusing on expectations, understood as additional utility values delivered at the point of purchase. The application of various data processing techniques aims to design customer relationships by taking into account psychological, cultural, social, and economic characteristics (Rosa, 2005).

Companies can collect extensive user data already at the stage of transforming it into information, using appropriately designed data analysis programmes within the enterprise (Szwarc, 2010). From an IT perspective, the quality of a product or service remains unchanged; however, expectations – namely, the manner in which information about the product or service is presented to customers – should be adapted.

By utilising electronic platforms that store historical customer data, it is possible to personalise relationships between stakeholders and the company. Such actions may result in processed data becoming a highly attractive form of personalised promotion, potentially engaging additional individuals (Meyer-Waarden, 2013). Special offers, as part of a company's pricing strategy, may serve as a key marketing tool for retaining existing customers or acquiring new ones (Hansen, 2006).

2. Tailoring Customer Value Propositions via Digital Marketing Channels (@Marketing) (Kretek, Dworak, 2020)[1]

From the perspective of relationship management, the personalisation of offers leads to higher customer satisfaction with products or services. This is due to the increasing demand for individualised service during various stages of customer acquisition and retention (Bleier, De Keyser, Verleye, 2018). While personalisation was previously a direct means of meeting customer expectations, it is no longer considered an innovation; rather, it has become a near-standard practice among medium and large enterprises. It is perceived as a compromise between mass-market offerings and the vision of establishing direct contact between the company and its end users (Brown, 2018).

Effective personalisation may be implemented through @marketing, which is closely linked to the organisation's ability to initiate dialogue with consumers by transforming data into various forms of information delivered in a comprehensible manner and within the shortest possible time. The implementation of these changes should be overseen by a manager who, through the use of the Internet of Things (IoT), connect marketing, and artificial intelligence (AI), can persuade customers to purchase the company's products or services. Reliable information provided by @marketing should serve as a guarantee that the organisation will be perceived as a trustworthy economic entity, one that uses modern @programmes to safeguard the interests of its stakeholders.

The benefits resulting from the implementation of @marketing strategies will be reflected in the organisation's image, likely increasing the number of clients engaging with the innovative method of diagnosing patient health conditions. A practical example underpinning the discussion on personalised actions involves organisations within the healthcare sector, particularly therapeutic institutions (hospitals, clinics, health resorts, outpatient centres) operating in the private sector and serving individuals with various medical conditions. In this context, the product is medical information, which – through the application of @fractalisation – can be delivered to patients more rapidly and with greater precision.

The article discusses the concept of **fractals** – here understood as patients with identical or highly similar test results – allowing them to be grouped into fractal sets based on shared characteristics. This enables comparative analysis of the effectiveness of recommended treatments or therapies provided by different physicians or therapists. Such an approach may facilitate the automatic selection of the most suitable treatment, which could then be interpreted as a suggestion from a "computational specialist" acting as a consultant in complex clinical scenarios.

The content presented in this article should be regarded as conceptual models intended to inspire managers to implement them within therapeutic organisations under their leadership, with the aim of improving treatment outcomes. The primary objective of this article is to present the principles of @fractalisation in therapeutic organisations, specifically as a series of comparisons enabling the selection of the most effective treatment methods for conditions identified through structured medical examinations.

The problem addressed by the authors is expressed as follows: How can modern information technologies be used to transform data into personalised information capable of enhancing the quality of services provided?

The authors operate under the assumption that the observations made in this article do not, in any way, undermine the work of professionals employed in therapeutic organisations. Rather—and this must be emphasised unequivocally – they are merely a proposal for the utilisation, processing, and dissemination of data aimed at optimising knowledge about clients/patients through the use of modern information technologies. It should also be noted that @fractalisation may be regarded solely as a rapid form of computer-assisted consultation between physicians/therapists and specialists who have demonstrated success in improving patient health.

3. An Introduction to Typological Frameworks and Core Terminology

In economics, **typology** refers to the categorisation of individuals, objects, processes, and phenomena according to defined criteria and a set of principles (Typologia, 2025). Its primary aim is the operationalisation of conceptual meanings within a given domain through the use of metrics and indicators, the ranking of the examined set of objects, and the assignment of items or phenomena to specific categories in which similarities and differences can be identified (Biały, Długosz, 2015).

Classification, by contrast, is understood as a system for organising entities that share at least one common feature, which can be hierarchically structured (Surma, 2025). It focuses on the analysis of a limited number of observations that can be grouped or ordered into homogeneous sets (Kisielnicki, 2009).

An additional concept related to the grouping of studied objects is **typification**, which involves limiting the number of designed product types (in terms of their construction or production methods) to a manageable quantity, thereby enabling their **segregation** based on characteristics essential for determining functionality, production costs, and operational efficiency (Typizacja, 2025).

In traditional marketing, a similar concept is **segmentation**, which refers to the division of customers into homogeneous groups characterised by similar traits. Segmentation enables a more precise understanding of customer needs, allowing enterprises to refine their offerings in a manner that best meets those expectations (Segmentacja, 2018). Segmentation may be based on various criteria, including gender, age, marital status, education level, income, source of livelihood, nationality, place of residence, social group affiliation, or occupation (Konopka, 2021).

4. Fractalisation as a Method for Data Aggregation and Analysis

Given that the concepts of typology, classification, typification, and segmentation meet managerial expectations primarily in terms of dividing objects into homogeneous groups based on observable characteristics, a new category for grouping individuals under study has been articulated – namely, **fractalisation**. Unlike marketing segmentation, which focuses on dividing individuals according to easily observable physical traits, fractalisation is understood as the grouping of identical or nearly identical objects, processes, and events into sets based on "hidden" characteristics identified during the research process.

From a theoretical standpoint, data aggregation is based on fractals – geometric figures whose smaller parts, when magnified, resemble or replicate the original structure (Kudrewicz, 2015). "Fractals are interconnected through an efficient information and communication system. They autonomously determine the type and scope of their data access" (Warnecke, 1999). Furthermore, "fractals reorganise (restructure), regenerate, and decompose" (Warnecke, 1999). This allows researchers – after accepting primary features and excluding secondary ones (defining the fractal dimension) – to assign studied objects to a predefined set. Here, the term fractal dimension refers to the number of features that determine the complexity of an object, necessary for its assignment to a fractal set based on analogous traits (Falconer, 1997).

From this perspective, a point, line segment, circle, or sphere has one dimension; a rectangle has two dimensions; a cuboid has three dimensions, and so forth. These serve as criteria for aggregating the multidimensionality of objects (Pomiar wymiaru fraktalnego, 2008).

Thus, the fractal dimension does not depend on the size, colour, or material composition of the objects, which, from a practical standpoint, makes them appear highly similar. The fractal dimension is therefore a convenient attribute for formulating various types of assertions about objects (Kudrewicz, 1993).

In simplified terms, when selecting clients, the key information is not whether the individual is middle-aged or elderly, male or female, or holds higher or primary education. Rather, the crucial factor is how the individual can be fractalized – that is, assigned to an existing set of objects with a similar internal structure.

A defining feature of the fractalisation process is the continuous observation of factors that alter the structure of an object's "hidden" characteristics. This enables initial assignment to a given fractal set, followed by potential reclassification into another set with different attributes. In a world dominated by information technologies, traditional methods of grouping objects into homogeneous sets are implemented by IT specialists through algorithms. This dynamic form of fractalisation may be referred to as @fractalisation.

It is worth noting that with the advancement of computer technologies, algorithms are increasingly used to perform repetitive tasks across various production domains. In such contexts, each new product – despite differing in colour, shape, or size—may be considered a fractal due to selected features that render it similar to a homogeneous group (Peitgen, Jürgens, Saupe, 2002).

5. Operational Procedures and the Implementation of Fractalisation within Healthcare Systems

The process of @fractalisation within the domain of medical services is primarily based on the method of abstraction – defined as the omission of secondary patient characteristics and the identification of those deemed essential (Abstrahowanie, 2025). In this context, the term "fractal dimension" is replaced by the notion of "marketing fractalisation dimension", understood as the number of "hidden" traits considered by a physician or therapist during comparative analysis, enabling the assignment of a patient to a specific fractal set.

Within this framework, the following categories of individuals may be distinguished:

- Those affected by similar physical ailments – individuals who do not stand out in a crowd, yet through the analysis of medical tests, therapeutic approaches, and dietary regimes, may be grouped according to predefined criteria. Here, diagnostic results are of primary importance; gender and age are of minor relevance, while education and place of residence are considered negligible.
- Individuals with psychological conditions – who function within society until their "hidden" traits, such as behaviour in public spaces, work performance, or parental functioning, deviate from accepted norms. The therapist's focus on identifying individuals within a population who share identical determinants of depression, neurosis, burnout, or apathy becomes a priority. This enables the assignment of such individuals to a fractal set of patients with similar conditions. Careful observation of their behaviour allows for the identification of endogenous or exogenous factors that may trigger a transition out of the assigned fractal set.

@Fractalisation thus enables not only the inclusion of a new object (patient) into fractal set "Q", characterised by specific parameters at time t_0, but also the automatic response to a change in one of those parameters at time t_1, resulting in reassignment to set "V". The most critical aspect of this process is the analysis of prescribed therapeutic methods by various medical professionals, the outcomes of which determine the patient's transition from set "Q" to set "V". From a practical standpoint, this mechanism facilitates the assessment of medical effectiveness. Positive outcomes serve as the basis for medical benchmarking (Bonelli, 1992), indicating which recommendations led to increased recovery rates, while negative outcomes help eliminate errors arising from incidental circumstances.

The dimension of @fractalisation is defined by the number of hidden traits (indicators) that characterise a patient's health status. The therapist or physician may freely determine which of these traits to consider during @consultations, selecting those deemed most relevant to the specific clinical context.

6. The Role of Quantitative Analysis in Patient Fractalisation Processes

Currently, standard laboratory reports present individual test results in tabular columns, allowing only for the identification of values that fall within or outside the normative range. In contrast, the process of @fractalisation of patients comprises three distinct stages.

Table 1.
Fractalisation Matrix of Selected Medical Indicators [@fraktalisation patients]

	Indicator 1 **(Leuk.) Leukocytes**	Indicator 2 **(Hemo.) Haemoglobin**	Indicator 3 **(Lymph.) Lymphocytes**	Indicator 4 **(Plat.) Platelets**	Indicator 5 **(Hct.) Haematocrit**
150-159%					
140-149%					
130-139%					
120-129%					
100-119%					
Upper Norm = 100%	**Leuk$_{max}$) = 11.0 = 100% = 100 pts**	**(Hemo$_{max}$) = 18.0 = 100% = 100 pts**	**(Lymph$_{max}$) = 4.5 = 100% = 100 pts**	**(Plat$_{max}$) = 400 = 100% = 100 pts**	**(Hct$_{max}$) = 52.0 = 100% = 100 pts**
90-99%					
80-89%					
70-79%		**(Hemo$_{min}$) =** 13.0 = 72,2%			
60-69%					
50-59%					
40-49%					**(Hct. $_{min}$) = 40.0 = 76,9%**
30-39%	**(Leuk $_{min}$.) = 4.0 = 36.6%**		**(Lymph. $_{min}$.) = 1,5 = 33.3%**	**(Plat. $_{min.}$) = 150 = 37,5%**	
20-29%					
10-19%					

Source: own study.

In the first stage, a @fractalisation matrix is constructed, as illustrated in Table 1. For the purpose of presenting the @fractalisation model in medicine, it is assumed that the values of individual indicators change linearly and that all are stimulants. Accordingly:

- The upper normative threshold for all indicators is defined as (W_{max}). Values exceeding this threshold signal the emergence of pathological symptoms. For the purposes of @fractalisation, the upper norm for all indicators – regardless of their numerical values – is standardised to 100%.

In Table 1, the indicators are as follows: (Le_{max}) = 11.0 = 100%; (He_{max}) = 18.0 = 100%; ($Lymph_{max}$) = 4.5 = 100%; ($Platelets_{max}$) = 400 = 100%; ($Haemoglobin_{max}$) = 52 = 100%. Each of these values is assigned a score of 100 points.

- The lower normative threshold for all indicators is defined as (W_{min}). Values below this threshold also indicate the presence of pathological symptoms.

For the purposes of @fractalisation, the lower norm is expressed by the formula:

$$W_{min} = Wp \times 100\% \div W_{max}$$

In Table 1, the indicators are:

1. Leukocytes $Leuk_{min} = 11.0 \times 100\% \div 4{,}0 = 36.6\%$.
2. Haemoglobin $Hemo_{min} = 13.0 \times 100\% \div 18.0 = 72\%$.
3. Lymphocytes $Lymph_{min} = 4{,}5 \times 100\% \div 1.5 = 33.3\%$.
4. Platelets $Plat_{min} = 1{,}5 \times 100 \div 4{,}5\% = 37.5\%$.
5. Haematocrit $Hema_{min} = 40.0 \times 100\% \div 52.0 = 76.9\%$.

- The grey-shaded area in Table 1 indicates that if all of a patient's test results fall within this range, the patient may be presumed to be healthy. This assumption is made solely for the purpose of presenting the @fractalisation model.
- Indicators that fall above the upper norm or below the lower norm signal a pathological condition. Again, this assumption is made for illustrative purposes within the @fractalisation model.

In the second stage, the matrix presented in Table 1 will be populated with the test results of patient "A" – (113.6; 112.2; 72.2; 86.6; 58.0; 61.5) – which will serve as the criteria (dimensions) for their @fractalisation. These values will enable the identification of identical or similar cases among other examined patients, as illustrated in Table 2.

Table 2.
Fractal Set 'Q' – @fractalising patients based on laboratory test results at time point t_0

	Indicator 1 **(Leuk.) Leukocytes**	Indicator 2 **(Hemo.) Haemoglobin**	Indicator 3 **(Lymph.) Lymphocytes**	Indicator 4 **(Plat.) Platelets**	Indicator 5 **(Hct.) Haematocrit**
150-159 %					
140-149%					
130-139%	**Patient A = 12,5 =113,6**				
120-129%		**Patient A = 20,2 = 112.2%**			
100-119%					
Upper Norm = 100%	**($Leuk_{max}$) = 11.0 = 100% = 100 pts**	**($Hemo_{max}$) = 18.0 = 100% = 100 pts**	**($Lymph_{max}$) = 4.5 = 100% = 100 pts**	**($Plat_{max}$) = 400 = 100% = 100 pts**	**(Hct_{max}) = 52.0 = 100% = 100 pts**
90-99%					
80-89%			**Patient A = 3,9 = 86,6%**		
70-79%		($Hemo_{min}$) = **13.0 = 72,2%**			
60-69%					
50-59%				**Patient A = 232 = 58.0**	
40-49%					**(Hct_{min}) = 40.0 = 76,9%**
30-39%	**($Leuk_{min}$) = 4.0 = 36.6%**		**($Lymph_{min}$) = 1,5 = 33.3%**	**($Plat_{min}$) = 150 = 37,5%**	
20-29%					**Patient A = 32 = 61.5**
10-19%					

Source: own study.

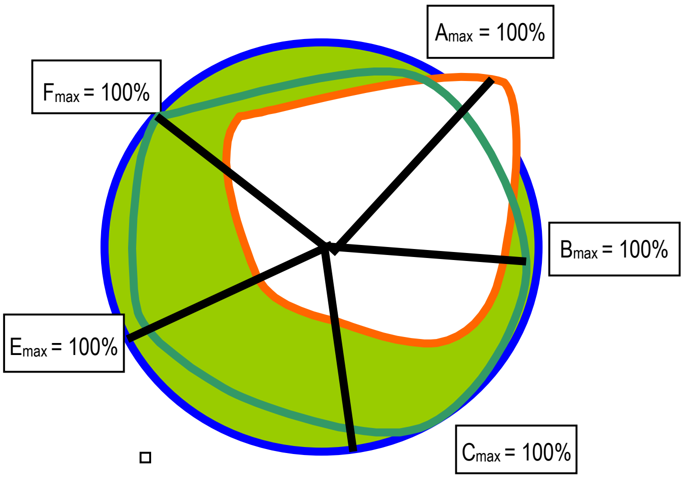
Individuals who, based on blood test results at time t_0, exhibited the following values: Leukocytes – 113.6%; Haemoglobin – 112.2%; Lymphocytes – 86.6%; Platelets – 58.0%; Haematocrit – 61.5%, will be assigned to fractal set "Q" (allowing for minor deviations).

In the third stage, at time t_1, all patients within fractal set "Q" underwent the same diagnostic tests again, enabling an analysis of the effectiveness of therapies recommended by various physicians and therapists. This approach allows the clinician treating patient "A" to benefit from the insights of a "specialist" who has achieved the most favourable outcomes in similar cases.

The stages of @fractalisation presented here should be regarded as a model developed through quantitative research. In this instance, the dimension of @fractalisation is five – referring to the number of indicators included in Tables 1 and 2, which were considered in the analysis. In future applications, this number may be expanded by incorporating additional patient-specific factors such as age, gender, and others.

@Fractalisation will involve the reassignment of a patient/fractal to a different group when changes in test results occur as a consequence of treatment.

The data presented in Table 3 may be visualised using a radar chart, as illustrated in Figure 1.



– A_{max}, B_{max}, C_{max}, D_{max}, E_{max}, F_{max} = 100% – maximum reference values.

– **Minimum reference values** calculated using the formula: $Ind._{\%min} = Ind._{min} \div Ind._{max} \times 100\%$.

– **Value of the examined indicator** calculated using the formula: $Ind._{\%Exam.} = Ind._{Exam.} \div Ind._{max} \times 100\%$.

Figure 1. Indicator model relative to the upper reference limit.

Source: Author's own elaboration.

The set of maximum values for selected indicators (A_{max}, B_{max}, C_{max}, ..., F_{max}) serves as a visible reference point for visualising relationships among the remaining data. Rapid generation of such a presentation, based on the values collected and entered into Table 2, is no longer a technical challenge. Its advantage lies in the use of symbolic markers to represent the width of normative ranges, thereby clearly illustrating the patient's health status – both in a static view and dynamically (with the possibility of incorporating historical test results).

Moreover, the chart enables the identification of changes resulting from therapy, thereby demonstrating the effectiveness of interventions that have restored a given indicator to its normative range. This occurs when the examined indicators $W\%_n$ fall within the interval between the maximum value $W\%_{max}$ and the minimum value $W\%_{min}$, i.e.: $W\%_{min} \leq W\%_n \leq W\%_{max}$.

Such a chart allows the patient to analyse multiple pieces of information simultaneously. Depending on the context, the evaluation framework may be adjusted. For instance, if the minimum normative values are set as the 100% reference point, the result will be a circular plot with two curves representing the maximum normative values positioned externally. In a third possible variant, the reference points (100%) are defined by the patient's own values, forming a circle surrounded by a curve representing maximum normative values and enclosed by a curve representing minimum normative values.

@Fractalisation provides the physician with visual access to information regarding:

- which patients with similar test parameters recovered most rapidly,
- which physician made the most accurate diagnosis,
- which medications and methods of administration yielded the best outcomes.

The presented model of patient @fractalisation, based on quantitative research, should facilitate efficient communication regarding health status. When applied in practice, the Internet of Things (IoT) can automatically notify the patient of subsequent test results, suggest appointments with specialists, and, in justified cases, even transmit prescriptions – e.g. via the e-Patient system. This approach allows the form of patient service to be tailored to expectations regarding the quality of care provided by modern therapeutic organisations.

It is also worth noting an additional practical application of @fractalisation: the transmission of supplementary knowledge to patients that may influence their health-related behaviours. This is achieved through prediction (in statistical analysis, the forecasting of future outcomes or statistical characteristics of random phenomena) (Predykcja, 2025), which in this context functions as a conduit for additional information about individuals who, having identical or similar medical test results:

- received a diagnosis of illness,
- recovered following treatment,
- incorporated dietary changes into their therapy,
- reduced stress in their lives.

@**Prediction** – here understood as a novel form of forecasting applied in therapeutic contexts – acts as a knowledge repository concerning individuals with comparable test results. It enables patients to access personalised insights into behavioural strategies appropriate to their condition.

7. @Fractalisation – Application of Qualitative Research Methods

@Fractalisation may also be applied to the grouping of individuals with advanced psychological conditions, based on the manner in which they express opinions regarding: the competence of medical professionals, laboratory diagnostics, the behaviour of superiors, family acceptance, and transcendental experiences.

For example, @fractalisation in this domain is illustrated in Table 4, where:

- Indicators Wfs_1, Wfs_2, Wfs_3, Wfs_4, and Wfs_5 represent the percentage acceptance of various forms of opinion expressed by individuals from the patient's immediate social environment concerning their condition.
- A scale for evaluating the indicators is presented, ranging from 10% to 90%;

The indicator "Patient Trust Level" (W Trust Level) is defined for each @fractalisation dimension. These are expressed as numerical ratios: 80/20 = 4.0; 70/30 = 2.3; 50/50 = 1.0; 20/80 = 0.16; 20/80 = 0.16.

Table 3.
@Fractalisation with the Application of Qualitative Research Methods

Percentage of Patients Accepting:					
Indicator / Evaluation Scale	**Wfs_1 Acceptance of physicians' actions regarding their condition**	**Wfs_2 Acceptance of acquaintances' opinions on laboratory results**	**Wfs_3 Acceptance of superiors' behaviour regarding similar conditions**	**Wfs_4 Acceptance of family opinions on limitations caused by illness**	**Wfs_5 Perceived influence of transcendental experiences on recovery**
100%					
90%[2]					
80%	■				
70%		■			
60%					
50%			■		
40%					
30%					
20%				■	■
10%					
Trust Index (W Trust Level)	80/20 = 4,0	70/30 = 2,3	50/50 = 1,0	20/80 = 0,16	20/80 = 0,16
The fractal label "(4; 2.3; 1.0; 0.16; 0.16)" defines the content of the fractal set, allowing for a deviation of up to 0.05 from the calculated indicator values presented in Tables 1 and 2.					

Source: own study.

In this example, individuals who, by completing questionnaires, characterised their level of trust in therapeutic interventions according to the credibility of: physicians' opinions, laboratory results, assessments by superiors, family perspectives, and spiritual requirements, were represented by the numerical values: "(4; 2.3; 1.0; 0.16; 0.16)". These individuals are assigned to the fractal set bearing this designation.

This enables the therapist or clinician to gain a visual and analytical understanding of the patient's personality and mental disposition, thereby facilitating the assignment of the individual to an appropriate therapeutic approach.

Table 4.
Extended Analysis of the Fractal „(4; 2,3; 1,0; 0,16; 0,16)"

Elements of the Fractalisation Set Type "A"	**Numerical Characteristics of the Fractal Set**	**Commentary**
Column 1	Column 2	Column 3
@Fractalisation Dimensions	Wfs1; Wfs2; Wfs3; Wfs4; Wfs5	Number of indicators considered.
Maximum Degree of @Fractalisation	Calculation: 5 × 90% = 450 percentage points, where 450 = 100%, representing full acceptance of all forms of therapeutic persuasion.	This is a hypothetical reference value used for comparative purposes. A respondent/patient scoring 450 points is considered fully receptive to all forms of therapeutic persuasion.
Evaluation Ranges for Therapeutic Influence on Patients	Personality types of therapeutic patients: A. 10-30% – "Non-receptive" B. 31-50% – "Resistant" C. 51-70% – "Compliant" D. 71-90% – "Communicative" E. 91-100% – "Cooperative"	Placement of a patient within any fractal range provides guidance to the therapist regarding the personality type they are engaging with.
Actual Degree of @Fractalisation	Calculation: 80 + 70 + 50 + 20 + 20 = 240 percentage points, which in secondary standardisation equals 240/450 × 100 = 53.33%	The therapeutic personality of the patient is characterized at 53.33%, indicating moderate susceptibility to persuasive methods.
Most Effective Form of Persuasion for Fractal Set "(4; 2.3; 1.0; 0.16; 0.16)"	Therapeutic actions based on indicator "Wfs_1", i.e. (80/20 = 4.0)	Persuasion models developed for individuals exhibiting these parameters.
Patient's Trust Level in Opinions Expressed by Their Social Environment	Calculation: sum of values (80/20 = 4.0) + (70/30 = 2.3) + (50/50 = 1.0) + (20/80 = 0.16) + (20/80 = 0.16) = 7.62	Additional Information: • The maximum level of patient trust in expressed opinions is calculated as: 5 × (90 ÷ 10) = 45. • The arithmetic mean of the patient's trust level in the therapy is: 45 ÷ 5 = 9. • The trust level regarding the examined fractal was established at 7.62, which allows for an estimation of the challenges faced by the therapist in the execution of their professional duties.

Source: own study.

In summary, the information contained in Table 4 regarding the effectiveness of therapeutic interventions within the fractal set serves as a guide for selecting persuasive strategies that are most likely to influence patient behaviour positively.

8. Concluding Remarks from a Managerial Perspective

The patient @fractalisation system developed using the Internet of Things enables the personalisation of medical services through artificial intelligence. By replacing segmentation based on explicit client characteristics with @fractalisation focused on latent traits, therapists and physicians can benefit from expert recommendations in the diagnostic process.

From a @marketing perspective, @fractalisation allows therapeutic organisations to: build a positive reputation within their environment, enhance brand recognition, and attract new clients—ultimately aiming to maximise profitability (Noga, 2009). The key drivers of success in this context include:

- Automated patient notifications – not only regarding test results and appointment scheduling, but also offering diagnostic support from specialists whose patients have demonstrated rapid recovery.
- Enhanced promotional strategies through the integration of advanced information technologies in patient care.
- Facilitating patient interaction with others belonging to the same fractal set.
- Reducing the cost of medical services by enabling early-stage diagnosis based on validated clinical patterns.
- Replacing traditional methods of health status communication with digital channels, such as the e-Patient system, mObywatel, or mojeIKP.

@Fractalisation enables: comparative analysis of outcomes achieved by different physicians and therapists; immediate transmission of reliable health information; and minimisation of the time required to reach an accurate diagnosis.

Additionally, the introduction of the concept of "defractalisation" – understood as the suspension of all categorisations based on object characteristics – allows for the identification of patients whose test results, despite varying endogenous and exogenous factors, have consistently remained within the normative range over time. This process facilitates the selection of individuals whose living conditions, dietary habits, and stress management strategies have not significantly impacted their health status.

9. Summary and Closing Reflections

The system of patient @fractalisation developed through the Internet of Things enables the personalisation of medical services via artificial intelligence. By replacing segmentation based on explicit client characteristics with @fractalisation focused on latent traits, therapists and physicians can benefit from expert recommendations in the diagnostic process.

From a managerial perspective, the proposed model of @therapeutic services allows healthcare managers to build a positive institutional image, which may translate into an increased number of patients seeking treatment. Successful outcomes – particularly faster recovery trajectories – serve as the most compelling endorsement for choosing these facilities.

@Fractalisation, as an innovative method of transforming quantitative and qualitative research data into actionable insights for improving therapeutic effectiveness, is expected to influence the decision-making of individuals affected by various conditions in selecting their place of treatment.

Below is an example of informational content intended for potential patients, describing the therapeutic method based on @fractalisation:

The personalised therapy offered in our facilities is based on @fractalisation, which involves grouping patients according to characteristics that allow individuals undergoing standard preventive examinations to be assigned to a set referred to as fractals. These are patients with identical test results, similar perceptions of their environment, and shared inherited value systems.

The diagnostic and therapeutic @fractalisation system enables the identification of effective recovery methods based on numerous analogies supported by artificial intelligence. AI, drawing upon data from thousands of patients, uses algorithms to assist physicians and therapists in: Determining the most effective therapeutic approach for individuals with observable physical conditions, including recommending medication types and dosages that have contributed to rapid recovery in similar cases; Identifying determinants that improve mental health by selecting persuasive arguments that encourage sceptical individuals to engage in health-promoting behaviours.

AI-driven comparisons – based on thousands of patients treated successfully across various global locations – provide ready-made recommendations for physicians and therapists regarding the most appropriate therapeutic strategies to restore health in the shortest possible time.

Footnotes

1. Terms preceded by the symbol "@" refer to internet-based activities, as previously introduced and explained in: Kretek, H., Dworak, J. (2020). Post-Pandemic Marketing. @Marketing. In: *Multidisciplinary Aspects of Production Engineering, Part 2* (pp. 585-594). Monograph. K. Midor (ed.). Warsaw: Sciendo Publishing, ISBN e-Book: 978-83-66675-03-2, ISBN Print: 978-83-66675-02-5,.
2. This study does not take into account legal constraints related to data confidentiality.
3. The concept of "@fractalisation" has been introduced to draw managerial attention to its practical relevance in shaping a positive organisational image through internet-based tools.
4. A distant yet illustrative analogy is the water molecule, which in its fundamental structure is a fractal. Depending on environmental conditions, it may take various forms—ice, snow, rain, hail, or frost. In this case, the hidden features (atomic structure) of H_2O remain identical across all physical states, despite differing observable properties. Fractalisation, therefore, involves both the identification of endogenous characteristics that render objects similar, and the recognition of exogenous phenomena that influence those characteristics.
5. The term "marketing fractalisation dimension" has been introduced to distinguish it from the already established concept of "fractal dimension", which is used in other scientific disciplines.

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