TUNED

neuroscience applied to architectural design

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Tuned Scientific Responsible, Architect, graduated from IUAV in Venice. Scientific Responsible of the NAAD Master 'Neuroscience Applied to Architectural Design' at the IUAV University of Venice. Editor with Vittorio Gallese of the 'ROOMS' International Research on the study of the perception of the interior space of schools, hospitals, public halls and airports. Director with Sarah Robinson and Alessandro Gattara of the new architecture magazine Intertwining For Mimesis International. Author with Vittorio Gallese of Tuned Architecture for 2016 Overview Publisher Padova and of The architecture of differences for TArch Edizioni 2013 Padua.
He has written and edited collections of essays, coordinated the editorial board of Anfione and Zeto and organized seminars and conferences. He has carried out public and private construction projects and participated in International Competitions.

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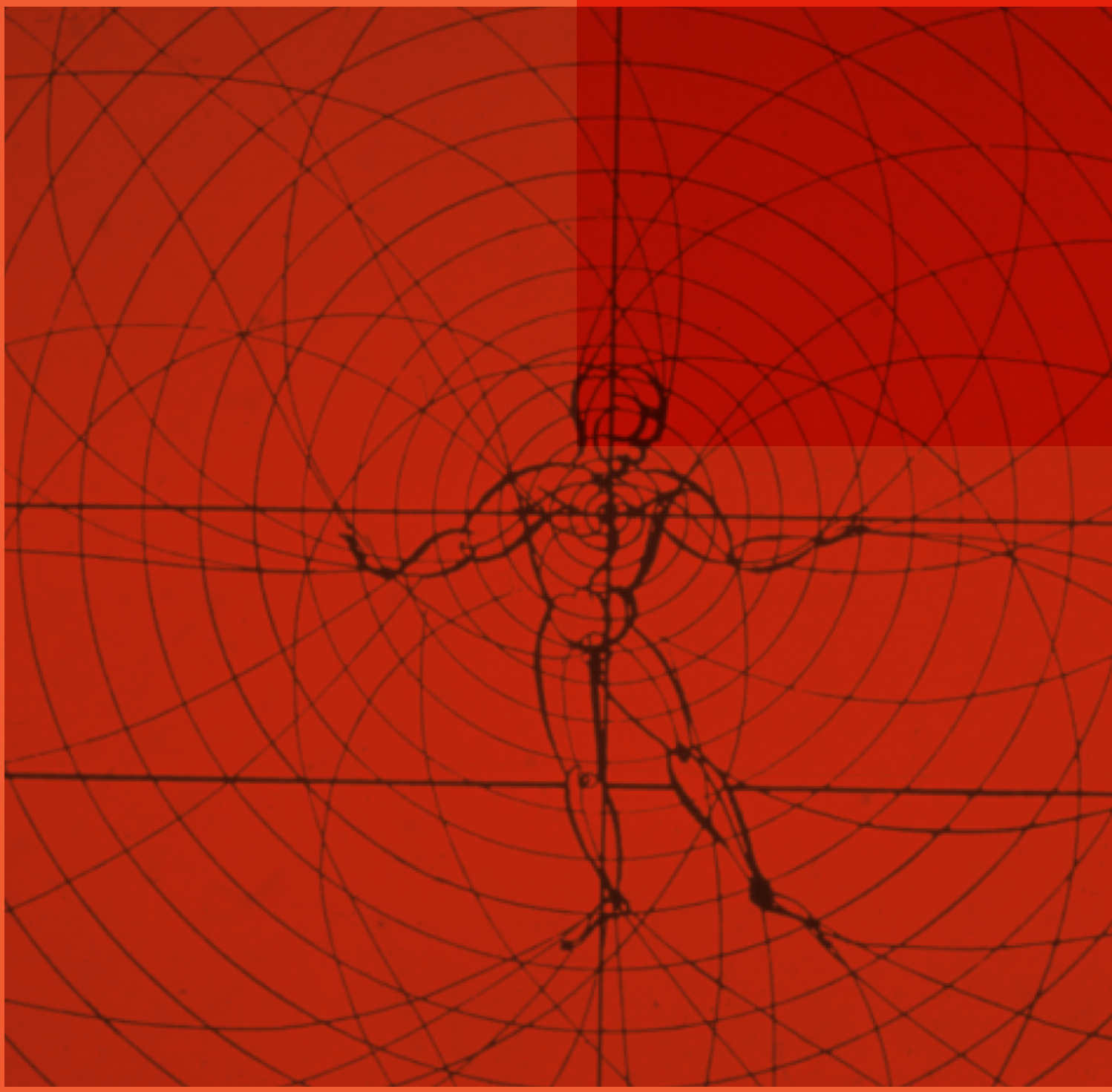


Drawing of Man as Dancer. Oskar Schlemmer, 1921

application of **TUNED**: win win operation

Harmony is a word that has almost disappeared from the vocabulary of architects, too often engaged in the production of exciting figures and landmarks.
Yet today, thanks to a renewed dialogue between science and the humanities, it is possible and necessary to reconstruct a new balance between people and their actions, their experiences and architecture. Putting people firmly back at the centre of architectural projects: this is the ultimate goal of **TUNED**.

/ TUNED for architecture in tune with people

The goal of **TUNED** Is to develop a first phase of the Preliminary Project. Based on its indications, subsequent design phases will lead to works that will bring out emotions and feelings in users that are in line with the deepest expectations sparked each day.

This balance protects **the biological value** and **the potential of people** together with the economic value of buildings and public space built according to this design method.

/ The expectations of human experiences

Each day, as soon as we wake from sleep, we begin to make decisions of different types and relevance. **Each decision triggers an experience and produces an expectation**. In everyday life, at the higher levels of consciousness, no deeper expectations manifest themselves. The goals that are immediately achievable are visible, while it is more difficult to access the deep level of expectations: in fact, they are precognitive expectations. **The expectation is an unknown and as such produces an imbalance**, a vibration. It triggers tension that changes the homeostatic equilibrium of our organism. It thus creates a connected background feeling, at the level of the proto-self, the basic emotion of fear. The goal of vigilant consciousness, which formulates choices, is **to balance our body through experience**. If the imput that this experience conveys to the body is in tune with expectations, gradually a balance is restored: fear is reabsorbed and the homeostatic picture is balanced. What shape do expectations have? These appear to the nuclear consciousness of the subject as background feelings, in fact, they are the very essence of each experience. When experiences occur, **the feeling that resonates is in tune with the initial expectation**, it is awakened by 'nesting' one of the most basic positive emotions of our depths: joy, research, care or pleasure, depending on the different choices and experiences in progress. Developed over the course of evolution, expectations are universal, even if they are expressed differently, in each cultural and geographical context. **The architectural environment**, In which this process takes place, can act against or in favour of re-balancing. Its effects, recorded by the receptors of the entire body-brain organism, can appease or facilitate the constant balancing act at work in each individual.

/ Reference figures

Francisco **Varela**

Neurobiologist

Louis **Kahn**

Architect

Tim **Ingold**

Anthropologist

Juhani **Pallasmaa**

Architect

Harry **Mallgrave**

Architectural historian

Evan **Thompson**

Philosopher

What is TUNED for?

School

Users
+ Attention - concentration - motivation - relationships

Customers
+ Improve learning and parents' trust

Home

Users
+ Energy Recovery - Psycho-physical Balance

Customers
+ Increase in value and efficiency

Office

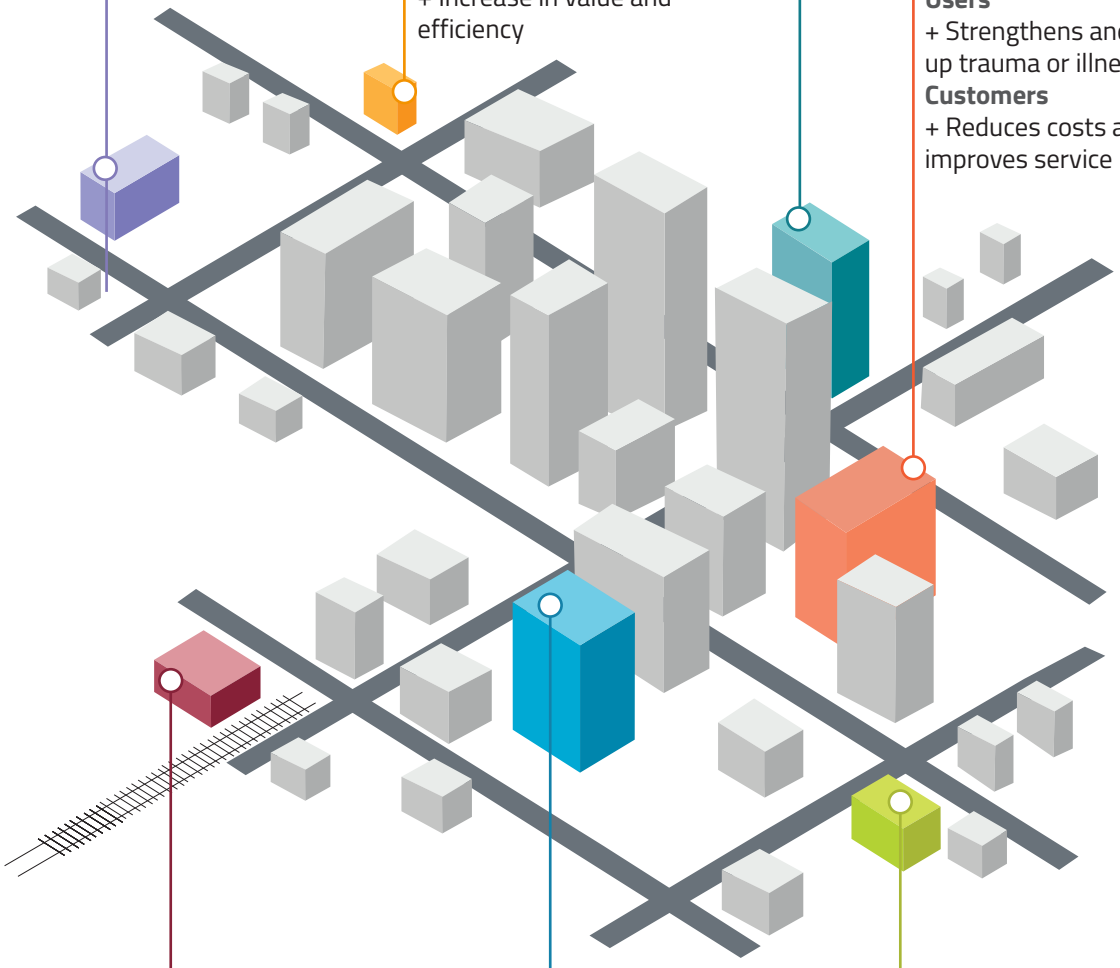
Users
+ Motivation - reduces stress
- Team building

Customers
+ Increased productivity

Hospital

Users
+ Strengthens and speeds up trauma or illness recovery

Customers
+ Reduces costs and improves service



Retail

Users
+ Trust and satisfaction

Customers
+ Increase in sales

Station

Users
+ Availability - Relationships between travellers - Frequency of use

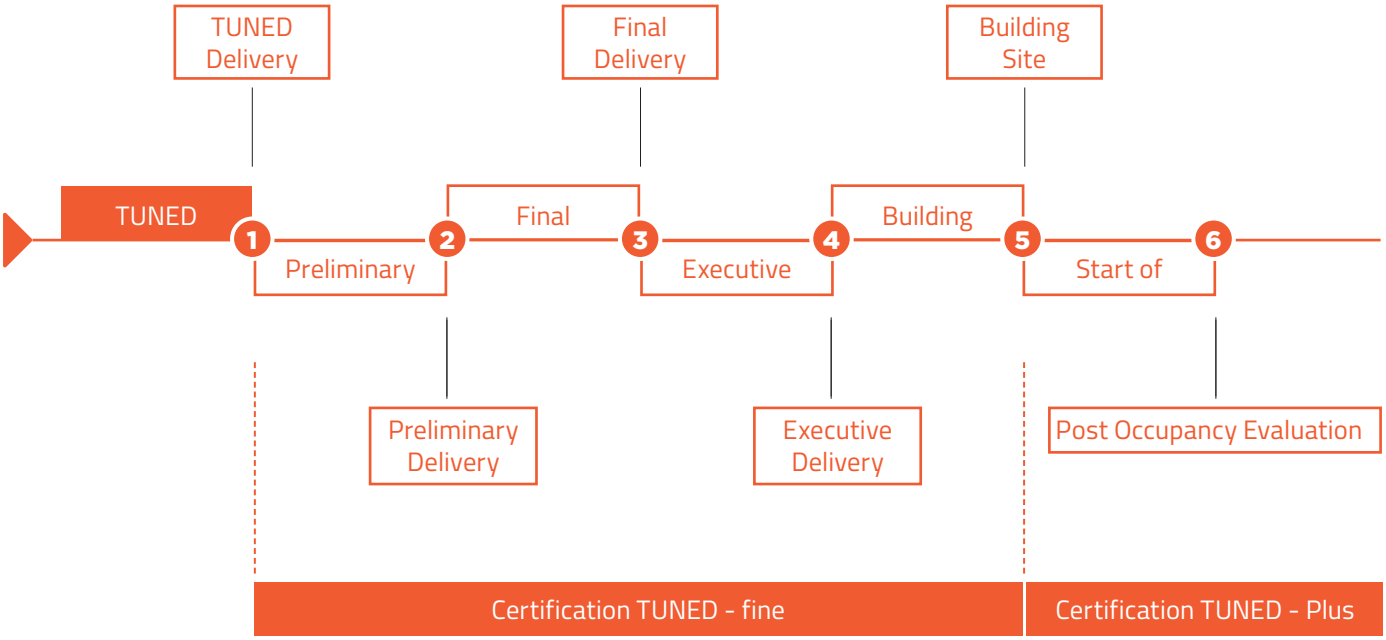
Customers
+ Increase in revenue

Nursing Care Homes

Users
+ Positive ageing
- User-staff relations - user-user relations

Customers
+ Costs reduction and increased competitiveness

/ TUNED: Brief development phases



TUNED Is designed to guide activities in different areas, types of building and open spaces in the city.

TUNED Is structured to support new construction, re-structuring, interior and landscape design.

TUNED Build

It applies to new constructions and total renovations, including demolition and reconstruction. For designing interior spaces, the design levels inherent in geometry, topological displacement, the closeness of adjoining premises and natural light are the ESG* of the Brief. External image _ With **TUNED Build** The external image of the project places strong emphasis on consistency between the internal and external view of the Project Target.

TUNED Restart

Applies in the case of internal building renovations. For designing the Brief, design levels relating to materials, colours, textures, geometry, acoustics and visual rhythm are the ESG * of the Brief. In relation to structural and facade system modifications, the proximity of adjoining premises, topology and natural light can also form part of the ESG. External image. With **TUNED Restart** The external image of the project provides consistency between the internal and external perception of the Project Target.

TUNED Interior

It applies to existing indoor areas. For designing the interior space, the design levels relating to materials, colours, textures, geometry, artificial light, acoustics, and visual rhythm are the ESG* of the Brief. With regard to possible modifications to the façade system, natural light can also be included in the ESG. External image. Con **TUNED Interior** The external image of the project is not emphasised.

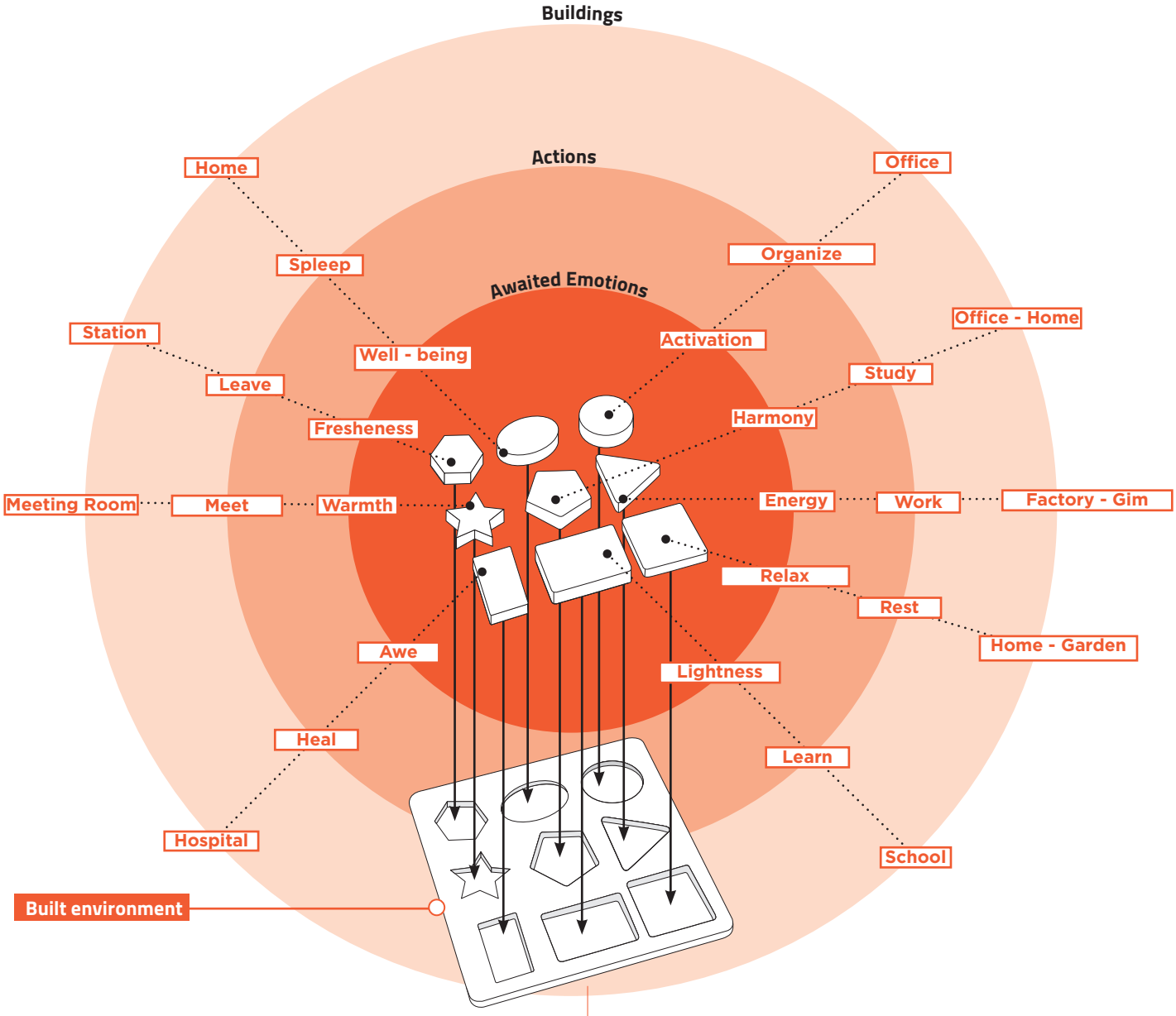
TUNED City

It applies to the open spaces of cities, to the system structured for bicycles and pedestrians, including linear paths, green areas and spaces for social interaction. For urban design, the design levels relating to topology, proximity to boundaries, materials, colours, textures, acoustics and visual rhythm are the ESG of the Brief. The development of the Brief is based on Social Neuroscience studies.

/ TUNED: Brief & Certificates

TUNED Brief & Certificates				
Codice	**List of activities**	**Brief**	**TUNEDfine**	**TUNEDplus**
A1	Study of Action Area	●	●	●
A2	Analysis of Functional Programme	●	●	●
A3	Definition of internal Clusters of the project	●	●	●
A4	Selection of Backgound Feelings to be associated with specific Clusters	●	●	●
A5	Association of Sensory-Motor Metaphors (SMM) and Homeostatic States (HS) with Background Feelings	●	●	●
A6a	TUNING IN Physiological Analysis of SMM and HS: intero-, proprio- and exteroceptive analysis	●	●	●
A6b	TUNING IN Physiological Analysis of SMM and HS: division into phases and focus on basic metaphors	●	●	●
Test DOXA	DOXA/Sample Group: through Focus Groups and/or Online Surveys on implicit and explicit preferences	●	●	●
B1	TUNING IN + Regulation of Post DOXA Physiological Analysis	●	●	●
B2a	Clusters of Project Configuration: main paths and trajectories identification	●	●	●
B2b	Architectural Clusters Configuration: division of Clusters into nuclei according to phases mentioned in A6 b	●	●	●
B2c	TUNING OUT BASIC: information on topology, geometry, proxemics, intensity, flow of light for each nucleus	●	●	●
B2d	TUNING OUT FINE: information on materials, rhythm, color, texture, sounds and scents for each nucleus		●	●
B3	Selection of Brief Guidelines: realization of a graphic scheme to maintain a coherent public image of the project		●	●
B4	SCHEME usage to regulate 3D relationships between clusters of project in the A1 area of intervention		●	●
B5	Drafting of matrices and Graphics for each Cluster of Project	●	●	●
C1	Assistance in preliminary and executive project development		●	●
C2	Assistance in Works Supervision			●
Test	Analysis of starting conditions of Sample Group by neuroscientific methods: MAAS, SART			●
Test	Analysis of Final Project Brief on Sample Group by neuroscientific methods: Virtual Reality and EEG + test			●
POE1	Post Occupancy Evaluation: DOXA Test on a sample of actual space users carried out through Focus Groups and Online Surveys about explicit/implicit preferences		●	●
POE2	Post Occupancy Evaluation: MAAS and SART assessment tests on actual space users by neuroscientific techniques and methodologies			●
POE3	Post Occupancy Evaluation: analysis of users' responses to real perception of used space by EEG			●

The project sets up the place able to trigger different feelings and emotions related to diverse activities and experienced moments of life.



Positive Effects

Individual

Homeostatic Regulation

Increase in cognitive activities

Memory **Attention**

Value

Group

Regolazione Omeostatica

Condizioni di base favorevoli per relazioni interpersonali

Value

Social - harmony in group
Individual - mindfulness
Economic - for activities carried out

/ The body produces meaning

The meaning, the concepts of human conscience, which led to the birth of language, lie on a mighty pillar: **the mimetic phase of evolution**.
In the space / time between the appearance of Homo Erectus (about 2.5 mill years ago) and that of Homo Sapiens (about 200-250 thousand years ago), thus verbal sounds and the development of language, well, in that long interlude, the transmission of meanings, the creation of the first collective rites and the first form of pedagogy were made possible by the development of **communication based on the use of the body**, of the limbs and of the face: mimicry. Children up to about 18 months, in fact, do not distinguish a meaning from its bodily expression. For these reasons human language and thought is built on the foundation **of sensory-motor** metaphors which use body movements in space to bring out meaning. The discovery of how the **same brain structures are activated in the same way** when they see an action, when they do it or remember it, has also made **it possible to identify how emotions and feelings deriving from the action are merged with the meanings of the same sensory-motor metaphor**. This happens due to the body, which acts as a medium, a crucial joint, a warm nucleus that unites meanings, movements and emotional structure. The history of **archetypal**, **taken from feelings** has been studied by great humanists and scientists.

/ Reference figures

Antonio **Damasio**

Neuro scientist

Vittorio **Gallese**

Neuro - scientist

Alberto **Perez Gomez**

Architectural historian

Alva **Noë**

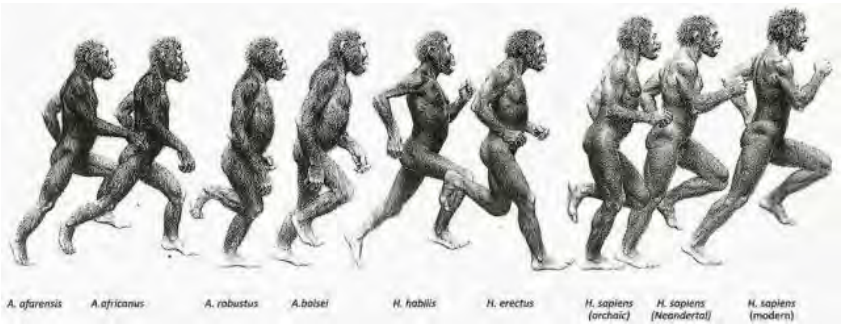
Philosopher

Mark **Johnson**

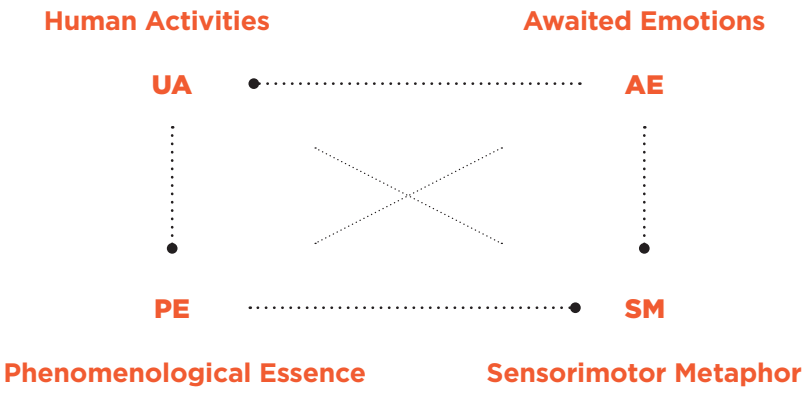
Philosopher

James **Gibson**

Psychologist



Neurophenomenological Knot



> We acquire a comprehensive system of primary metaphors, automatically and unconsciously, simply by living in the most ordinary way, in the world, every day, from our early years. We have no choice in this. Because of the way neural connections are formed during the 'conflaction' period, we all naturally think using hundreds of primary metaphors.
>
> **G. Lakoff** and **M. Johnson** from *Phisolophy in the flesh*.

Movements of the body cause correlated emotions to be 'engraved' in the cerebral cortex. Not only that, the image of the body itself is also recorded in the same mnemonic trace when it sees emotions, that is, feeling. The link between motor arrangements, emotions and feelings was shaped in the course of evolution, when, about three million years ago, Homo Erectus began the progressive refinement of standing upright.

What are Background Feelings of Anticipation?

Studying **Harmony**

Understanding **Rest**

Producing **Energy**

Transforming **Climbing**

Organising **Activation**

Creating **Dance**

Sleeping **Well-being**

Balancing **Floating**

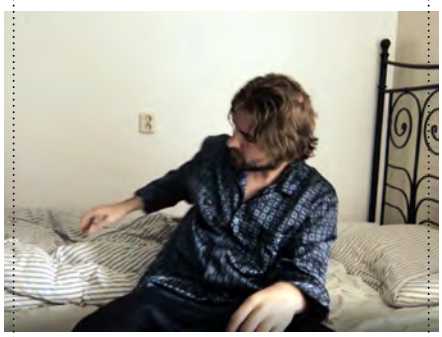
Learning **Lightness**

Growing **Jump**

Participating **Heat**

Belonging **Hug**

Living **Relax**



Coming back **Lying down**

Leaving **Freshness**

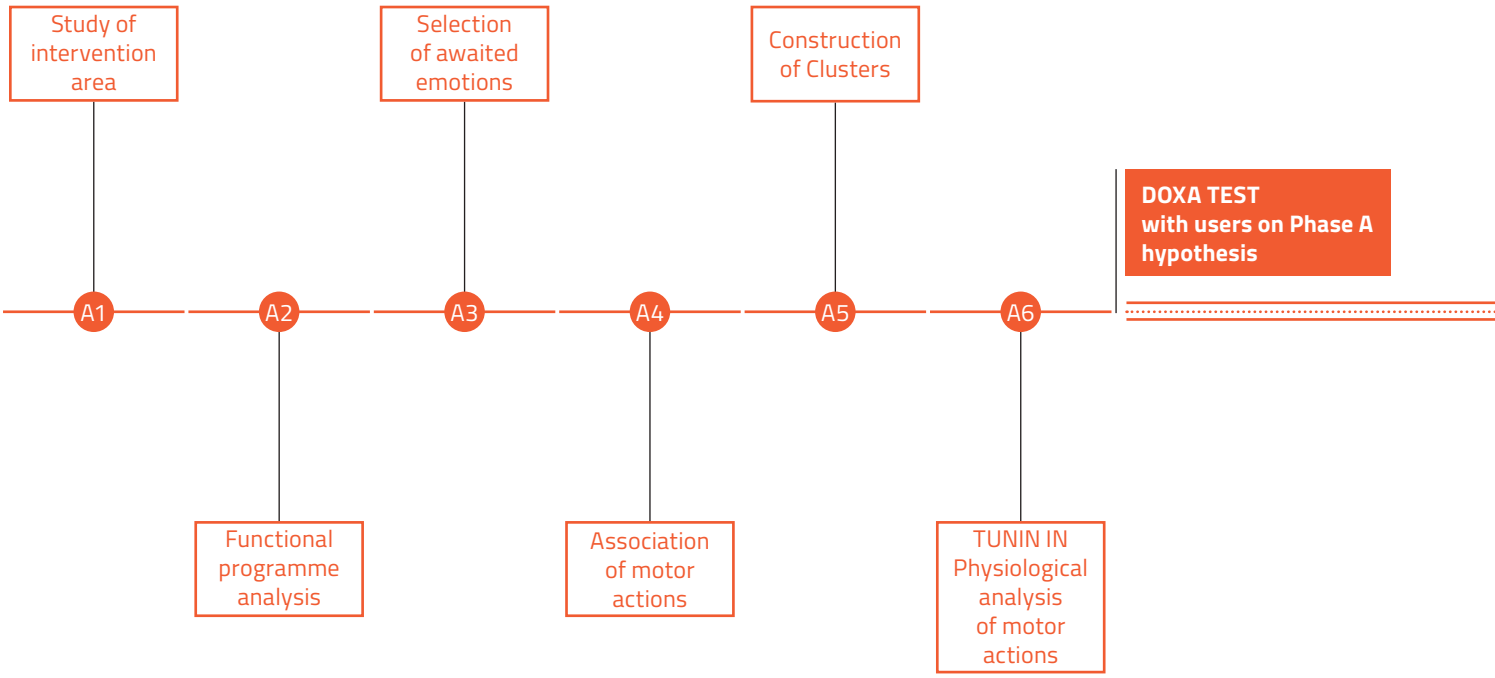
Changing **Dive**

Healing **Awe**

Reborn **Birth**

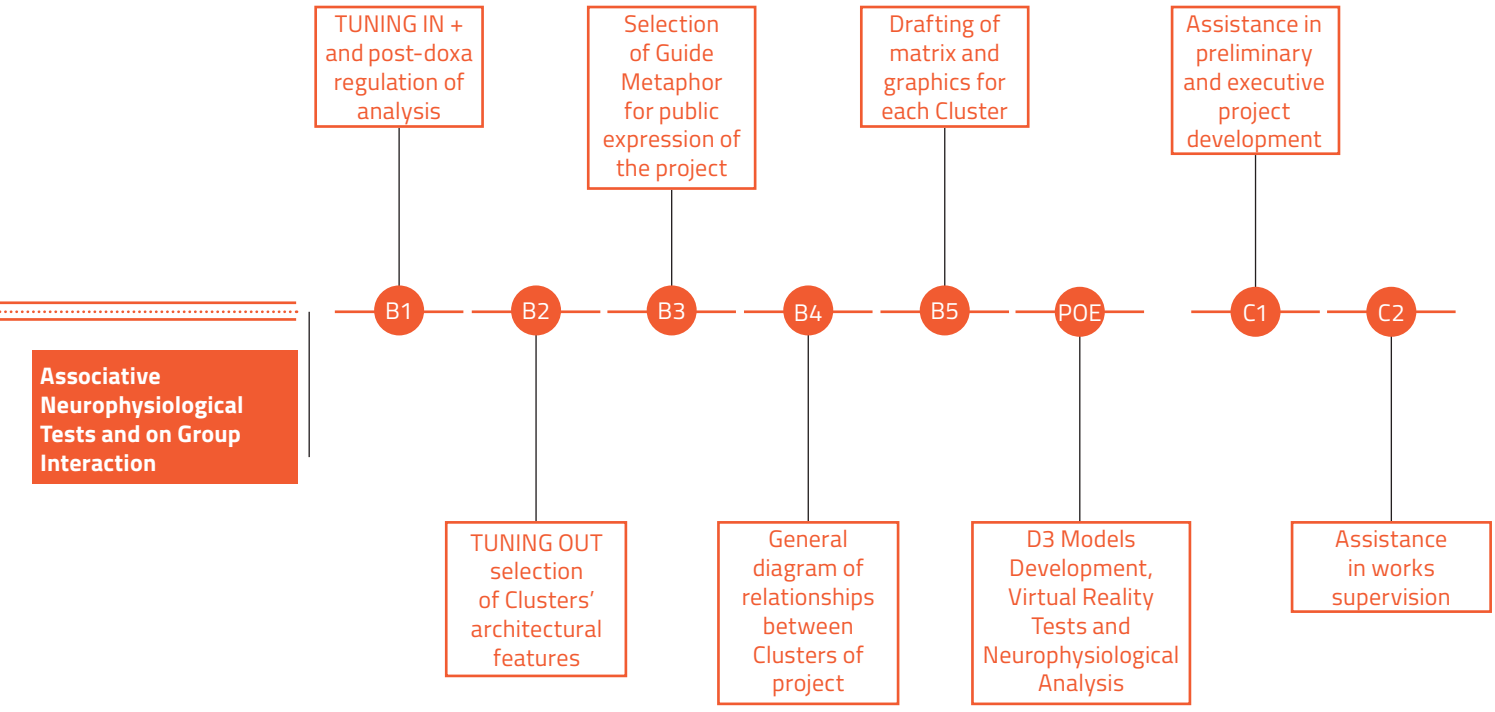
TUNED: Brief development phases

PHASE A



FASE B

FASE C



Associative Neurophysiological Tests and on Group Interaction

What's the Brief? How does it develop?

PHASE A: Preparatory and screening stages

A1 Study of Intervention Area

Access systems, architectural emergencies, urban fabric, scale and orientation are identified in the intervention area.

A2 Functional Programme Analysis

Environmental units of the project are divided into service spaces and main spaces.

A3 Selection of Awaited Emotions

On the basis of neurophenomological analysis of various activities, users' Awaited Background Feelings are identified within specific Clusters.

A4 Association of Motor Actions

By using the same methodology the motor actions embodying the awaited emotions are selected for each of the Cluster.

A5 Construction of Clusters

Phase B – Main environmental units are put together as an homogeneous context, in small groups, so that through the use of environments specific background feelings can surface.

A6 TUNING IN Physiological analysis of Motor Actions

Each motor action is broken down into its constituent time steps and analysed for each sensory channel modified by the motor action itself.

DOXA tests with users and measurements

Focus Groups, online Surveys, IAT, MAAS, SART, Group Behaviors Analysis, EEG in VR. DOXA Analysis, with users and/or sample groups, allow to decline Phase A hypothesis in the context. Researchers determine starting measurements on what already exists as reference for the project's effects.

Fase B: Development of Project Brief

B1 TUNING IN + Regulations of Post DOXA Physiological Analysis

Physiological analysis are improved on the basis of tests and surveys' results.

B2 TUNING OUT Definition of Clusters' architectural features

For each Cluster it is realised a matrix to identify those architectural features producing an effect on the sensory system so as to activate memory recovery of the motor action and the related feeling.

B3 Selection of Guide Cluster expression of the project

Among the background feelings surfaced, as project objective, is selected the one that best represents the shared public meaning of the intervention. It is created a representative image to guide the choice of the project's urban image and the external features of individual Clusters.

B4 General Diagram of Clusters of Project

The representative image guides the 3D general diagram configuration of Clusters derived from Functional Programme Analysis.

B5 Drafting of Matrices and Brief's graphics

Constituent environmental units (from Phase A3) are identified for each Cluster, and are finally associated with the Brief Matrix derived from Phase B2.

POE Analysis and Measurements on 3D models in Virtual Reality

Focus Groups, Online Surveys, IAT, MAAS, SART, Group Behavior Analysis, EEG in VR. 3D digital models of individual Clusters are developed according to information provided in their respective Brief Matrix. New measurements and tests are compared with those made at the end of Phase A to highlight the effects of TUNED application and/or to improve the information from the Brief.

/ **Complex projects:** a sensorimotor metaphor system

In the development of complex projects, it is necessary to conceive the space to accommodate diverse and multiple experiences. As in the case of the hospital, where the three main nuclei are: operating, hospitalisation and diagnostics blocks. Each of these experiences is linked to a different sensorimotor metaphor, which triggers the perception of different background feelings.

operating block

hospital

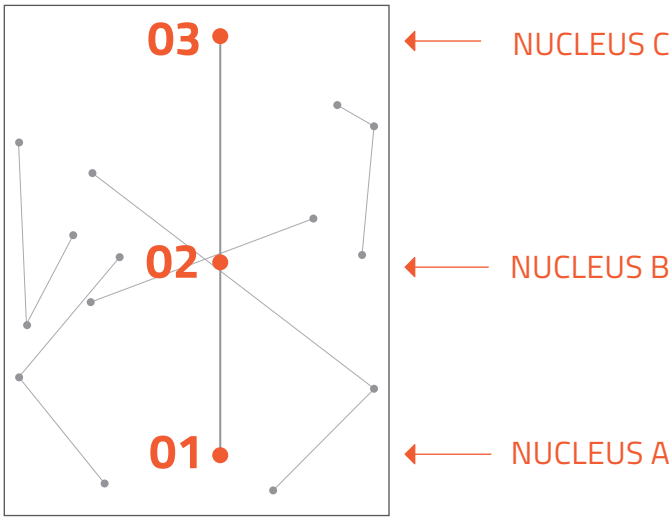
diagnostics

/ Sensorimotor metaphors phases and homogeneous clusters

The development of the **BRIEF** requires the HAU **homogeneous Clusters** of the space to be created to be detected: in doing this we analyse the functional program of the programmed work (or of the existing space, in the case of a work on property that already exists) and identify the architectural areas whose sequential use is repeated by people most frequently, in statistical terms. This is the **Homogeneous Area Units HAU** system whose perception, over time, defines the prevalent perception and hence the background feeling that is detected.

/ The phases of the sensory-motor metaphor: **the jump**

/ The Cluster's prevailing path



The propedeutic passage to the definition of the **BRIEF** consists in **matching together the phases of the sensory-motor metaphor with the nuclei of each individual** HAU clusters Identified by the program and analysis of people flows and pathways. Once the first step is done, the conditions for characterising the atmosphere of the project are created, that is, the polyphonic system of sensory signals, detected by the people receptor system, reveals the background feeling of the source metaphor.

TUNED

is the initiative of Lombardini22 SpA

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