How to frame a scene is as much relevant as the scene itself, including all the choices concerning a certain point of view, a particular focal length, the shape of the layout and so on. This apparatus involves decisions supporting the story told by a painting, enhancing effects linked to a particular artistic genre or movement, a pictorial technique or an expressive intent.

Since these settings are real choices in the real world, it becomes extremely important to be conscious of the available options provided by rendering softwares when shifting to the virtual dimension - from how to chose a layout to how to set up a camera - since not taking any choice is a choice itself, simply taken by the programmers of that engine when called to define the default settings.
Camera widget

Any numerical camera is composed by a series of elements recreated in order to provide a realistic control of it. Besides the viewpoint (1. the place where you are looking from) and the target (3. the point you are staring at) there is a widget to control the rotation of the camera -so how to tilt it (4.), another one to open up or decrease the field of view, so manually changing the lens length, as well as a pair of ideal surfaces delimiting the beginning (6.) and the ending (7.) of the visible portion of space captured by the camera.

Mind that the Physical camera - e.g. so named in Vray - is also the tool to control the light exposure of a scene, being the rendering a simulation of the photography act happening in real life [We’ll face this topic in the lighting handbook].

drawings from ’Vermeer’s camera, uncovering the Truth Behind the Masterpiece’, Philip Steadman
The focal length tells us the angle of view - how much of the scene will be captured - and the magnification - how large individual elements will be.

A proper management of the lens length is necessary not only to include portions of space otherwise not visible with, for example, a lower angle, but also to emphasize a personal expressive intent (i.e. if used in an interior, by radically enhancing depth and distorting nearby objects, a very short focal normally gives a sense of anxiety, almost of vertigo, to the viewer).

VML: Vermeer Music Lesson
focal length [FF]

22.5 mm (original)
30 mm
40 mm
18 mm
10 mm
5 mm (previous page)
A camera rotation can add a lot of dynamism to your scene, specially if combined with a proper lens length (see previous chapter).

Although this kind of shot has been long more used in the cinematography environment - i.e. the Dutch Angle, a shot in which the camera angle is deliberately slanted to one side, used for dramatic effect to portray unease, disorientation, madness, etc. - it is not unusual in the history of art as well, in fact you may notice that the Vermeer Music Lesson is already a camera rotation case, which we straightened only for educational purposes.

Inception, Christopher Nolan, 2010, Warner Bros (US, UK)

0° | lens length 22.5 [mm]  
25° | lens length 22.5 [mm]  
341° | lens length 10 [mm]
Basically, in a rendering engine the type of camera determines how the scene (what you see, the model) is projected onto the screen (once you render it to get a bidimensional projection). The behavior of the rays cast into the scene can change according to the type of camera used.

Besides the standard camera (usually a pinhole), there are other types of camera, each one working with different lenses and, therefore, rendering a different projection of the scene. The most common are:

- **Spherical camera (1)**: the lenses has spherical form.

As shown in the following examples, with override FOV setting the renderer overrides the Field of View angle. (because some camera types can take FOV ranges from 0° to 360°.) This kind of camera can be useful to make HDRI like images.

- **Cylindrical (point)** (2) all rays cast from the center of a cylinder: 
  - z axis (vertical direction): the camera acts as a pinhole camera
  - x,y axis (horizontal direction): spherical camera.

- **Cylindrical (ortho)** (3) – Like the previous one, but with the camera acting as an ortho view in the vertical direction.
Fisheye lenses are exasperated wide-angle lenses able to produce strong visual distortion to create wide panoramics or hemispherical images. “Instead of producing images with straight lines of perspective (rectilinear images), fisheye lenses use a special mapping (for example: equisolid angle), which gives images a characteristic convex non-rectilinear appearance.”

Fisheye captures the scene as if it is normal pinhole camera pointed at an absolutely reflective sphere which reflects the scene into the camera’s shutter.

As the value approaches 0.0 the warping is increased.
Box camera

"Box – Six standard cameras placed on the sides of a box, generating a vertical cross format image.

This type of camera is excellent for generation of environment maps for cube mapping. The Box camera can also be used for generating irradiance maps for GI: First you would calculate the irradiance map with a Box camera, then save it to a file and finally reuse it with a Default camera that can be pointed in any direction."

Source (chaosgroup.com)

Although it is a very specific feature of software like Vray, the Box camera turns into something extremely interesting looking at the notorious Peepshow by Samuel Van Hoogstraten and imagine than that complex process can be obtained just turning on this option...

Peepshow faces with Views of the interor of a Dutch house
Samuel Van Hoogstraten 1655–60
National Gallery, London
camera location and target

In the representation of architecture it is customary that the position of the eyes and the gaze coincide, so that the vertical lines do not go toward a vanishing point and, consequently, are straight as in an orthogonal projection.

Although this is really a good norm, it should not be taken as an incontestable principle, since moving around the scene and changing the target can lead to other narrative lines, otherwise excluded in a more classical representation.

We can find an exceptional example of combined management of point of view, zoom (thus focal length change) and camera position in the dolly zoom (or vertigo effect), invented by Alfred Hitchcock in his notorious Vertigo.
The center of the canvas is neither coinciding with the vanishing point nor with any relevant geometrical element.

The vanishing point is displaced from the center of the canvas, focusing the apex of the drama on the arm of the lady, intending to play at the virginals.

The vanishing point is displaced from the center of the canvas, I decided to let it coincide with the edge between the wall and the window on the right, therefore empowering that line.

The front wall occupies the space between the pavement and the left wall, inscribing the core of the scene in a perfect square.

As in a scenic stage, three lines have the function of framing the scene, so letting the observer gradually approach the representation: on the left the edge of the window, on the right the border of the Caritas Romana painting, the last wooden beam of the ceiling above.

As in a scenic stage, three lines have the function of framing the scene, so letting the observer gradually approach the representation: on the left the edge of the window, on the right the border of the Caritas Romana painting, the last wooden beam of the ceiling above.
Gestaltic proportions

The vanishing point is - like in Vermeer’s Music lesson - not at the centre of the scene, but a bit shifted. I decided to let it coincide with the edge between the wall and the window on the right, therefore empowering that line.

The other edge of the window divides the image in two equal parts, so...

The proportion between the visible parts of ceiling and pavement is central in the composition: here the floor is twice the ceiling.

The limit of the pavement and the beginning of the other window are equally distant from the border of the drawing, thus generating a square including the core of the scene.

The "b+2b" proportion is repeated twice, therefore generating a rhythm between ceiling, windows, wall and pavement.

main areas/lines of the composition