Let's begin with the statement that there is a linear functional $W$ on $H \otimes H$ such that $tr( (Q_a \otimes R_b) W ) = \omega(a, b)$, the joint probability of measuring outcome $a$ on Alice's side and $b$ on Bob's side.

As a tensor network picture we have:

$$
\begin{array}{c}
\text{(}\begin{array}{c}
Q_a \\
R_b \\
W
\end{array}\text{)}
\end{array}
= W(g_{ab})
$$

Our goal is to be able to show that by possibly changing the measurements, we can have a similar equation with the added condition that $W$ is a density matrix and hence the system can be modeled as quantum.

To do this we define $V$:

$$
V = M
$$

and set

$$\tilde{Q_a} = V^{-\frac{1}{2}} M Q_a V^{-\frac{1}{2}}$$
It follows by plugging in these pictures that

\[ W(a|b) = \begin{pmatrix} Q_a & R_b \\ W \end{pmatrix} = \begin{pmatrix} Q_a & R_a \\ \geq & \leq \end{pmatrix} \]

which is what we want since

the density matrix associated to the projection onto the pure state

It remains to verify that \( \tilde{Q}_a \) is a measurement, i.e.,

1. \( \tilde{Q}_a \) is positive.
2. \( \sum_{a} \tilde{Q}_a = 1. \)

The former (1) is just the condition that \( W \) is positive on tensor products and the latter (2) is ensured by the definition of \( W \).