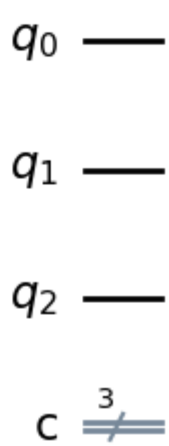
In [11]:
```
#Single Bit Error Correction Code
```

In [12]:
```
from qiskit import QuantumCircuit, transpile
from qiskit.visualization import plot_histogram
from qiskit_aer import AerSimulator
import matplotlib.pyplot as plt
```

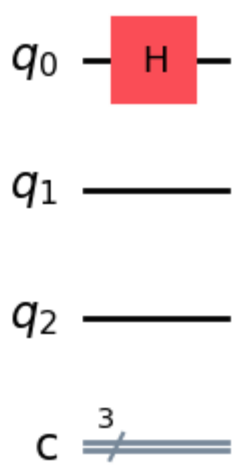
In [13]:
```
# Create a 3-qubit circuit + 3 classical bits for measurement
qc = QuantumCircuit(3, 3)
qc.draw(output="mpl")
```

Out[13]:



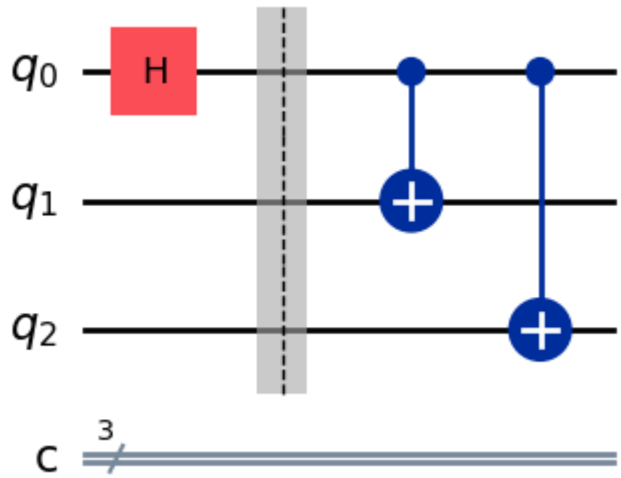
In [14]:
```
# Step 1: Encode logical qubit (start with |+> = H|0>)
#Encoding Step create qubit 1 in Superposition state using Hadamard gate
qc.h(0)
qc.draw(output="mpl")
```

Out[14]:



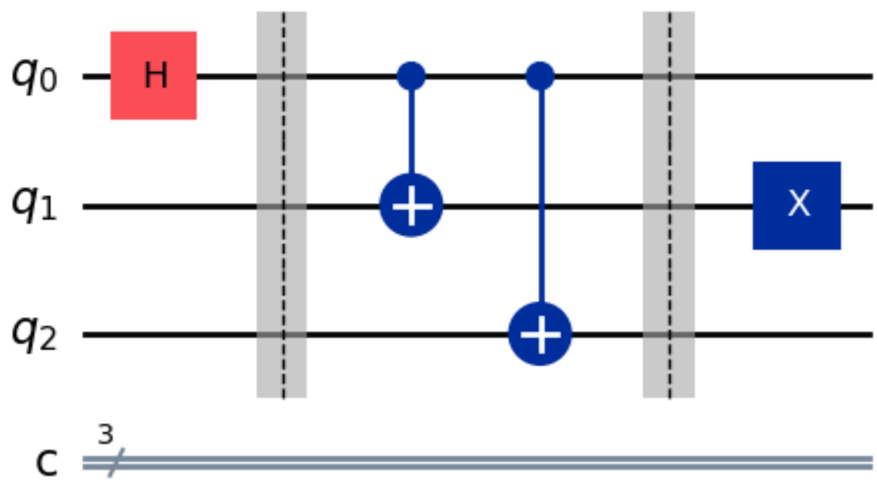
In [15]:
```
#Copy to qubit 1 and qubit 2 using CNOT gate
qc.barrier()
qc.cx(0, 1)
qc.cx(0, 2)
qc.draw(output="mpl")
```

Out[15]:



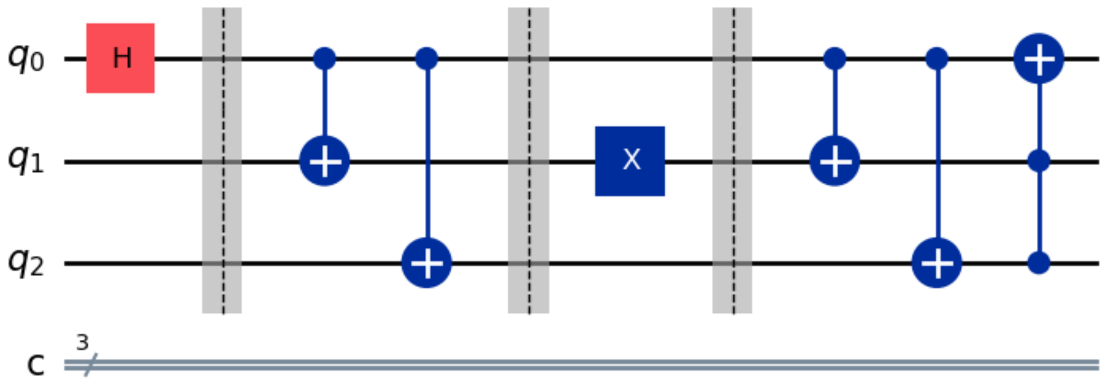
In [16]:
```
# Optional: Introduce a bit-flip error (on qubit 1)
qc.barrier()
qc.x(1)
qc.draw(output="mpl")
```

Out[16]:



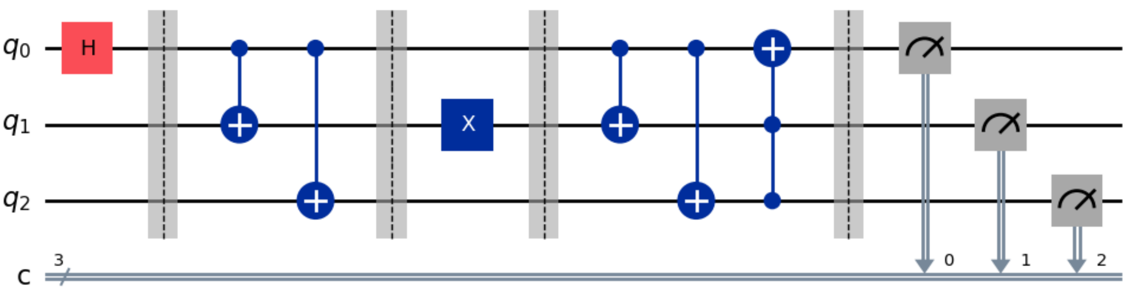
In [17]:
```
# Step 2: Decode (Majority voting — reverse the encoding) cx= CNOT Gate if (control
qc.barrier()
qc.cx(0, 1)
qc.cx(0, 2)
qc.ccx(1, 2, 0)      # Correct qubit 0 based on majority if 000/001/010/100=>000 an
qc.draw(output="mpl")
```

Out[17]:



In [18]:
```
# Step 3: Measure all qubits
qc.barrier()
qc.measure(0, 0)
qc.measure(1, 1)
qc.measure(2, 2)
qc.draw(output="mpl")
```

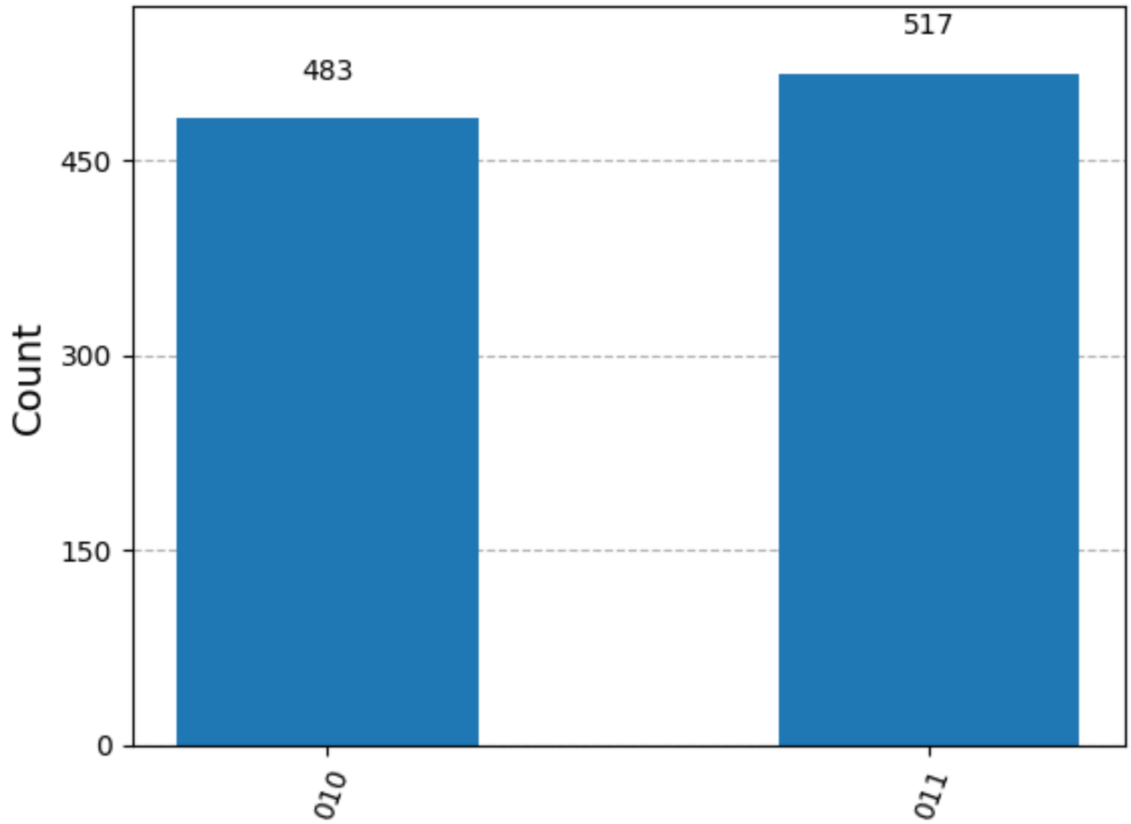
Out[18]:



In [19]:
```
#Introduce Simulator
simulator=AerSimulator()


# Transpile the circuit for the simulator
compiled_circuit = transpile(qc, simulator)

# Run the circuit on the simulator
job = simulator.run(compiled_circuit, shots=1000)

# Get the results
result = job.result()
counts = result.get_counts(qc)
print(f"Measurement counts: {counts}")

# Show results
print("Measurement outcomes:")
print(counts)
plot_histogram(counts)
```

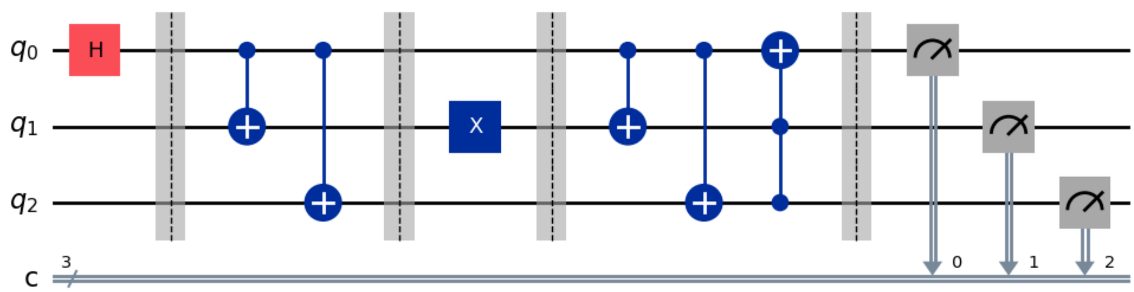
```
Measurement counts: {'011': 517, '010': 483}
Measurement outcomes:
{'011': 517, '010': 483}
```

Out[19]:



In [20]:
```
qc.draw(output="mpl")
```

Out[20]:



In [ ]: