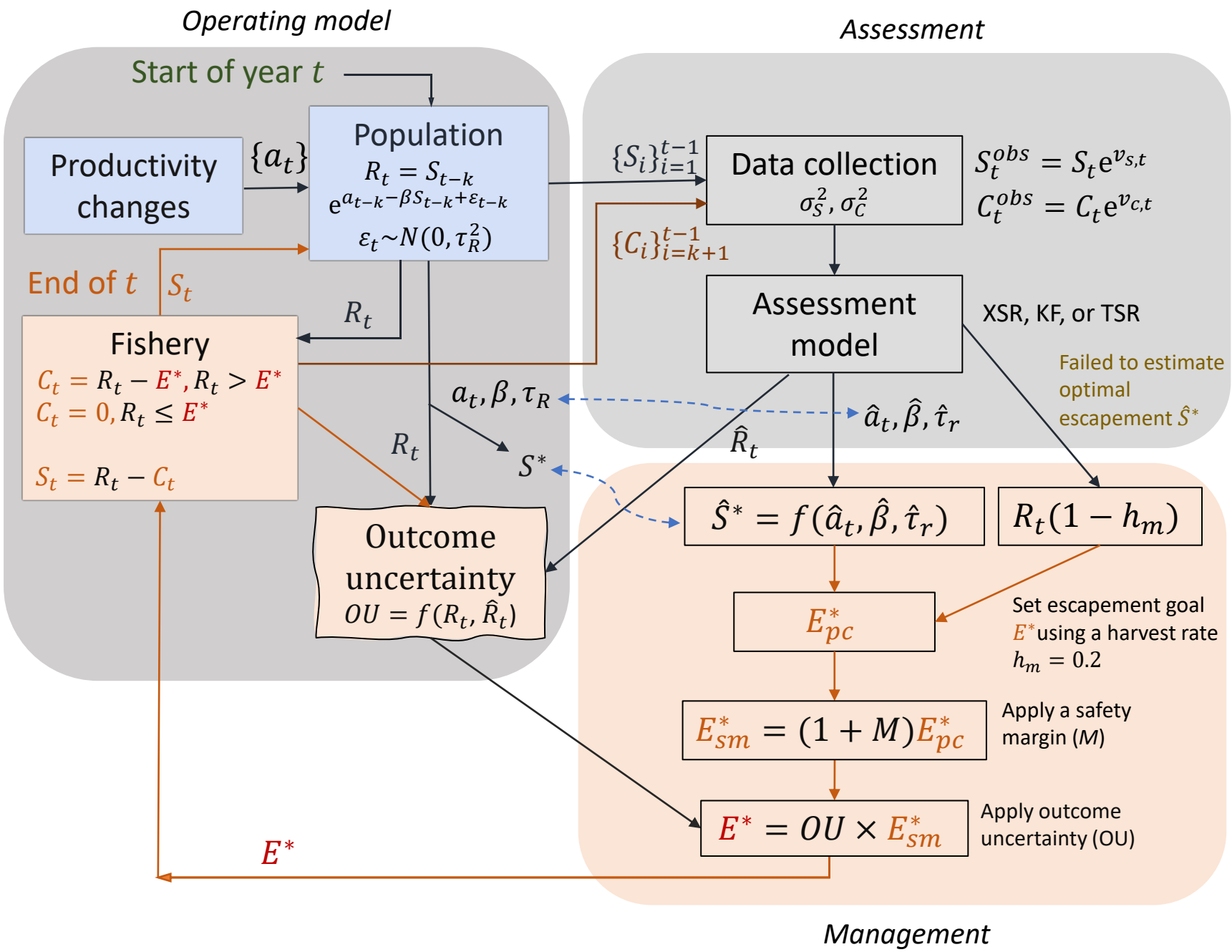
Operating model
Assessment
Start of year t
Productivity changes
$\{a_t\}$
Population
$R_t = S_{t-k}$
$e^{a_{t-k}-\beta S_{t-k}+\varepsilon_{t-k}}$
$\varepsilon_t \sim N(0, \tau_R^2)$
$\{S_i\}_{i=1}^{t-1}$
Data collection
σ_S^2, σ_C^2
$S_t^{obs} = S_t e^{v_{s,t}}$
$C_t^{obs} = C_t e^{v_{c,t}}$
$\{C_i\}_{i=k+1}^{t-1}$
End of t
S_t
R_t
Assessment model
XSR, KF, or TSR
Failed to estimate optimal escapement $\hat{S}^*$
Fishery
$C_t = R_t - E^*, R_t > E^*$
$C_t = 0, R_t \leq E^*$
$S_t = R_t - C_t$
a_t, β, τ_R
$\hat{a}_t, \hat{\beta}, \hat{\tau}_r$
R_t
S^*
$\hat{R}_t$
Outcome uncertainty
$OU = f(R_t, \hat{R}_t)$
$\hat{S}^* = f(\hat{a}_t, \hat{\beta}, \hat{\tau}_r)$
$R_t(1 - h_m)$
E^*_{pc}
Set escapement goal E^* using a harvest rate $h_m = 0.2$
$E^*_{sm} = (1 + M)E^*_{pc}$
Apply a safety margin (M)
$E^* = OU \times E^*_{sm}$
Apply outcome uncertainty (OU)
E^*
Management