FIMS

business

- Reference points
  - SPR proxy for biomass
  - MSY based
  - spatial
  - dynamic
- output products
  - programmatic generation
    - 508 compliant reports
    - presentations
    - Decision tables
    - stock status determination
    - SIS inputs
    - human readable output, accessible across discipline
    - easy to compare with other models
    - Spatially explicit
    - timestamped and easy to compare versions
- validation and peer review
  - predictive distributions
  - retrospective analysis
  - VISUAL fits to data
  - easy to generate and check Diagnostics
  - ASAP
  - WHAM
  - SS
  - bridge/compability to existing model
  - easy to compare prior and posterior distribution

non-functional

- reproducible
  - consistent code/input/output file structure
- developer experience
  - easy to add new modules
  - Swappable AD module
  - easy to add unit, integrated, automated test routines
  - code is easy to understand and maintain by a broad audience
  - contributing guide and workflow on github is clear
  - code syntax is consistent and follows a consistent style guide
- user experience
  - reliability
    - dependencies are supported and swappable if they are deprecated
    - well-tested
      - unit tests
      - integrated tests
    - easy to install and update
      - doesn't require admin
    - results stable on different OS
  - performance
    - fast under MCMC and MLE
    - cloud computing
    - parallelizable
  - ease of use
    - save input and outputs in file format
    - programmatic configuration and running
    - configuring and running in a GUI
    - rapidly explore outputs
    - well documented
    - informative error messages
    - easy to configure model options and specs

functional

- Forecasting
  - interactive and updatable in the future (e.g. accomodate new management regimes)
    - incorporate socioeconomic/policy updates
  - landings
    - user-specified
    - model calculated
    - constant
    - multi-fleet
  - F settings
    - user-specified F
    - F rebuild
    - HCrS
  - probabilistic outcomes
    - rebuilding
    - overfishing
    - uncertainty
  - incorporate legacy management structures
- environment
  - non-stationary states
  - random effects
- Socioeconomics
  - time varying, can be mirrored, allow for evolution, age-based
- data
  - Data limited
  - data poor
  - missing data
    - missing catches
  - real, processed
    - genetics
      - Close-kin mark recapture
      - stock mixture
    - tagging data
    - indices
      - fishery-independent
      - standardized CPUE
      - fishery-dependent
      - relative and absolute
    - include discards/retention
    - composition data
      - length frequency
      - age frequency
      - fishery dependent
      - CAAL
      - weight
      - discard
    - historical
    - electronic monitoring
    - diet
    - consistent metadata
  - real, raw
    - processing is transparent and reproducible
  - example/simulated
    - consistent metadata
  - human readable and consistent input
  - flexible and manipulable
    - transltated to/from other models
    - internally processed
  - socioeconomic
    - prices
    - quality
    - quotas
    - ex-vessel values
- flexibility in forms/parameterization (functional form, including time variation)
  - Recruitment
    - beverton holt
    - mean
  - Natural mortality
    - predation
  - Selectivity
    - age-based
    - length-based
    - domed
    - multiple functions for a fishery
    - seasonal
    - vessel effects
    - can incorporate covariates
  - growth
    - continuous
    - discrete (molting)
      - terminal molt
      - flexible transition matrix
    - bioenergetic
  - Fishing mortality
    - discard
    - multiple functional responses
  - retention
  - fecundity
  - movement
  - catchability
  - Prior/expert information
  - maturiyy
- Structure
  - age-structured
  - size-structured
  - surplus production
  - sex-specific
  - multiple fleets
  - multi-species
  - stage-structured
  - area-structured
  - flexible set up for Initial conditions
  - substocks
  - timing
    - multiple timesteps within a year
- Fitting, simulation, and estimation
  - median estimate parameters
    - bounds
  - convergence
    - stable
  - likelihood methods
    - likelihood for ech datum
  - Realistically simulate dynamics (MSE, simulation tests)
  - flexible weighting and tuning
    - auto-tuning
  - Capturing uncertainty/variability
    - estimated parameters
      - integrate multiple data sources
      - automatic jacobians
    - derived quantities
    - bootstrapping
    - state-space modeling
    - bayesian methods
    - Ensemble/multi-model inference
    - asymptotic
    - profile
    - machine learning/cross validation
  - estimate in phases
  - fix parameters