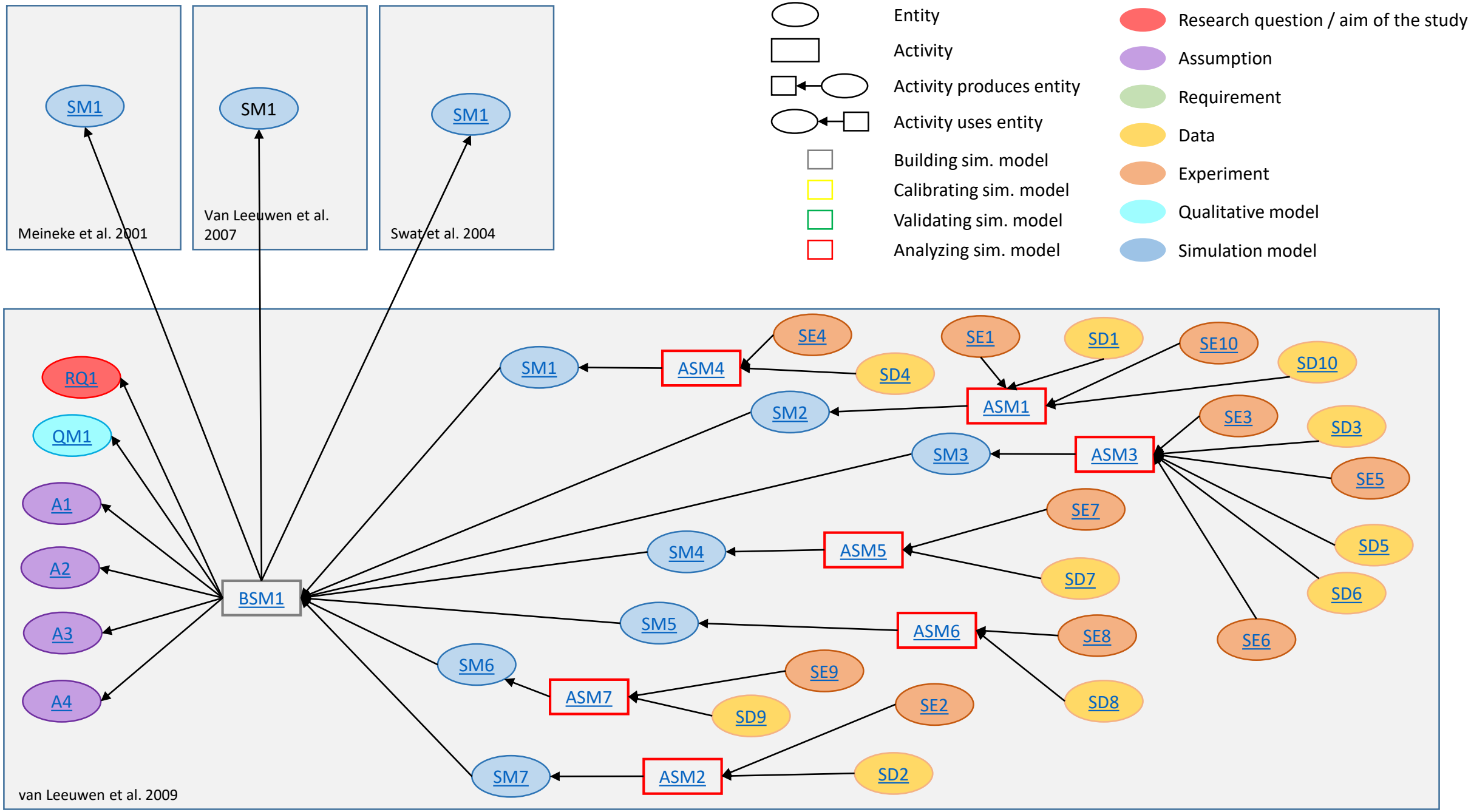
SM1
SM1
SM1
Meineke et al. 2001
Van Leeuwen et al. 2007
Swat et al. 2004
Entity
Activity
Activity produces entity
Activity uses entity
Building sim. model
Calibrating sim. model
Validating sim. model
Analyzing sim. model
Research question / aim of the study
Assumption
Requirement
Data
Experiment
Qualitative model
Simulation model
RQ1
QM1
A1
A2
A3
A4
BSM1
SM1
SM2
SM3
SM4
SM5
SM6
SM7
ASM4
ASM1
ASM3
ASM5
ASM6
ASM7
ASM2
SE4
SD4
SE1
SD1
SE10
SD10
SE3
SD3
SE5
SD5
SD6
SE6
SE7
SD7
SE8
SD8
SE9
SD9
SE2
SD2
van Leeuwen et al. 2009

SM1 Simulation model

Type	Label
Description	Mechanical model describing the attachment of cells to underlying substrate and the attractive/repulsive forces between cells which determines cell migration as well as cell division and cell differentiation
Reference	Not available
Study	Meineke et al. 2001

Back to the provenance graph

SM1 Simulation model

Type	Label
Description	Cell-cycle model characterizes the dynamics of the cell-cycle control system
Reference	Not available
Study	Swat et al. 2004

Back to the provenance graph

RQ1 Research question

Type	Label
Description	“test hypotheses concerning the regulation of this renewal process, to investigate how its dysfunction can lead to loss of homeostasis and neoplasia, and to identify potential therapeutic interventions”
Study	van Leeuwen et al. 2009

Back to the provenance graph

QM1 Qualitative model

Type	Label
Description	“Multiscale model for the dynamics of a colonic crypt”
Reference	Figure 2
Species	APC (destruction) complex, axin, cell-cell adhesion molecules (e.g., α-catenin and/ or E-cadherin), transcription factors (e.g., BCL9/Legless and/or TCF), β-catenin, retinoblastoma protein, transcription factor E2F1, transcription factor AP-1, cyclin D kinase complexes
Compartments	Cytosol
Study	van Leeuwen et al. 2009

Back to the provenance graph

A1 Assumption

Type	Label
Description	“assume that the signal remains unchanged during a given simulation and that cell i detects only the Wnt level at its centre”
Category	Conservation Law (355)
Study	van Leeuwen et al. 2009

Back to the provenance graph

A2 Assumption

Type	Label
Description	“suppose instead that it [strength of the spring connection] increases as the cell–cell contact length expands”
Category	Quantitative systems description parameter (2)
Study	van Leeuwen et al. 2009

Back to the provenance graph

A3 Assumption

Type	Label
Description	“supposing instead that the drag coefficient is proportional to the surface area of contact between a cell and the underlying basement membrane”
Category	Quantitative systems description parameter (2)
Study	van Leeuwen et al. 2009

Back to the provenance graph

A4 Assumption

Type	Label
Description	“direction of division is random in our simulations. However, daughter cells are now placed a fixed distance, L_0/2, in opposite directions from the mother cell, so that the centre of mass is conserved”
Category	Conservation Law (355)
Study	van Leeuwen et al. 2009

Back to the provenance graph

BSM1 Building simulation model

Type	Label
Description	Development of different multiscale models
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM1 Simulation model

Type	Label
Description	Meineke model (mechanical model with cell division, cell differentiation)
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM4 Analyzing simulation model

Type	Label
Description	Analysis of Meineke model
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE4 Experiment

Type	Label
Description	“study expansion of a clonal population in silico” (SM1: Meineke model)
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD4 Data

Type	Label
Description	Simulation results of SE4
Reference	Figure 7 columns I, II
Related to	SE4
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM2 Simulation model

Type	Label
Description	Wnt-dependent cell-cycle (WCC) model (models by van Leeuwen et al. + Swat et al.)
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM1 Analyzing simulation model

Type	Label
Description	Analysis of WCC model
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE1 Experiment

Type	Label
Description	“Predicted position-dependent cell-cycle times in the intestinal crypt” (WCC model)
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD1 Data

Type	Label
Description	Simulation results of SE1
Reference	Figure 4a
Relate to	SE1
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE10 Experiment

Type	Label
Description	“two equivalent crypt simulations, based on Hypotheses I (purely competitive scenario) and II (two molecular forms of β-catenin), respectively”
Reference	Not available
Category	Perturbation
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD10 Data

Type	Label
Description	Simulation results of SE10
Reference	Figure 9
Related to	SE10
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM3 Simulation model

Type	Label
Description	default multiscale crypt (DMC) model (Wnt profile + cell-cycle model + mechanical model)
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM3 Analyzing simulation model

Type	Label
Description	Analysis of DMC model
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE3 Experiment

Type	Label
Description	“large number of in silico labelling-index (LI) experiments” to “calculate how the percentage of labelled cells varies with position along the dissection line” (DMC model)
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD3 Data

Type	Label
Description	Simulation results of SE3
Reference	Figure 6
Related to	SE3
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE5 Experiment

Type	Label
Description	“study expansion of a clonal population in silico” (DMC model)
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD5 Data

Type	Label
Description	Simulation results of SE5
Reference	Figure 7 columns III, IV
Related to	SE5
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE6 Experiment

Type	Label
Description	“Dependence of cell size and geometry on cell adhesion”
Reference	Not available
Category	Parameter scan
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD6 Data

Type	Label
Description	Simulation results of SE6
Reference	Figure 8
Related to	SE6
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM4 Simulation model

Type	Label
Description	DMC model extended to include area-dependent drag
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM5 Analyzing simulation model

Type	Label
Description	Analysis of DMC model extended to include area-dependent drag
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE7 Experiment

Type	Label
Description	“Dependence of cell size and geometry on cell adhesion”
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD7 Data

Type	Label
Description	Simulation results of SE7
Reference	Figure 8
Related to	SE7
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM5 Simulation model

Type	Label
Description	DMC model extended to include edge-dependent adhesion
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM6 Analyzing simulation model

Type	Label
Description	Analysis of DMC model extended to include edge-dependent adhesion
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE8 Experiment

Type	Label
Description	“Dependence of cell size and geometry on cell adhesion.”
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD8 Data

Type	Label
Description	Simulation results of SE8
Reference	Figure 8
Related to	SE8
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM6 Simulation model

Type	Label
Description	DMC model extended to include both edge-dependent cell–cell adhesion and area-dependent drag
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM7 Analyzing simulation model

Type	Label
Description	Analysis of DMC model extended to include both edge-dependent cell–cell adhesion and area-dependent drag
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE9 Experiment

Type	Label
Description	“Dependence of cell size and geometry on cell adhesion.”
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD9 Data

Type	Label
Description	Simulation results of SE9
Reference	Figure 8
Related to	SE9
Study	van Leeuwen et al. 2009

Back to the provenance graph

SM7 Simulation model

Type	Label
Description	DMC plus Wnt signalling model
Reference	Not available
Study	van Leeuwen et al. 2009

Back to the provenance graph

ASM2 Analyzing simulation model

Type	Label
Description	Analysis of DMC plus Wnt signaling model
Study	van Leeuwen et al. 2009

Back to the provenance graph

SE2 Experiment

Type	Label
Description	“Predicted position-dependent cell-cycle times in the intestinal crypt” (DMC + Wnt)
Reference	Not available
Category	Time course analysis
Study	van Leeuwen et al. 2009

Back to the provenance graph

SD2 Data

Type	Label
Description	Simulation results of SE2
Reference	Figure 4b
Related to	SE2
Study	van Leeuwen et al. 2009

Back to the provenance graph