

COSMIC - ISO 19761

SimSE Games Generator Sizing Case Study

COSMIC Version 5.0

August 2026

Foreword.

This Case Study reports on the functional sizing of an application generator and a set of generated applications.

Using COSMIC function points (CFP) – ISO 19761, this study sized the functional user requirements of the 2024 SimSE educational game portfolio, including its game generator, shared analyzer tool, and six generated educational games.

These results provide an empirical baseline for the functional sizing of educational game generators and their outputs, and support future work on CFP-based effort estimation and evolution planning for SimSE-like portfolios as well as replication studies.

This Case Study is based on the paper: 'Sizing Software Application Generators: A Case Study of the SimSE Educational Games Generator for Software Engineering Students'[1].

- For COSMIC sizing terminology see the Measurement Manual Part 1 [2].
- For the COSMIC measurement guidelines see the Measurement Manual Part 2 [3].
- For fundamentals of software estimation see [4].

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1 INTRODUCTION.

A software application generator is a tool that generates software applications using a description of the desired functionality. This paradigm is often summarized as “software produced by the software” and is also referred to as software-generated or automatically generated software. In practice, a generator receives structured inputs (e.g., models, rules, templates, and configuration data) that represent the required behavior of the target application and produce executable artifacts. In some contexts, developers can also extend the generated application with additional programming.

In 2024, the COSMIC community published a dedicated sizing guideline for “generating applications” and illustrated it with a game generator (Game Maker), where a game can be produced without writing code, or with optional extra code when needed [5]. The COSMIC guideline addresses this by clarifying the role of the functional user, triggering events, and decomposition of generated-application size into (i) the size of the entered data, (ii) the size of the outputs required by the developer (when applicable), and (iii) the size of any functionality implemented via additional programming (when applicable).

This Case Study reports on the sizing of functional requirements implemented in the 2024 version of the SimSE portfolio, a software engineering simulation environment that supports the creation of multiple software process simulation games [1] – see also: SimSE Online.

Specifically, this study reports the COSMIC functional size of the SimSE generator, its shared analyzer tool, and its six generated educational games as available in 2024. This study focuses on the functionality relevant to the instructor/model creator as the functional user and reports size results that can be used as baseline data for future estimation, evolution planning, benchmarking, and replication studies.

2 DESCRIPTION OF THE SIMSE ENVIRONMENT.

2.1 General Architecture.

SimSE is organized around a generator-based architecture that separates the model construction from the simulation execution. The overall structure in Figure 1 illustrates how an instructor-defined model is transformed into an executable simulation environment used by students. The architecture can be understood as two main functional subsystems connected through a generation mechanism.

- The Creation Environment is responsible for defining the simulation model and producing the corresponding executable simulation.
- The Simulation Environment executes the generated model and provides interactive gameplay and analysis capabilities.

Between these two subsystems, the generator component reads the model specification and produces executable artifacts that instantiate the simulation.

This architecture establishes a clear boundary between specifications and execution. The model defines the structural and behavioral characteristics of the game, whereas the runtime environment implements and enforces these characteristics during the simulation.

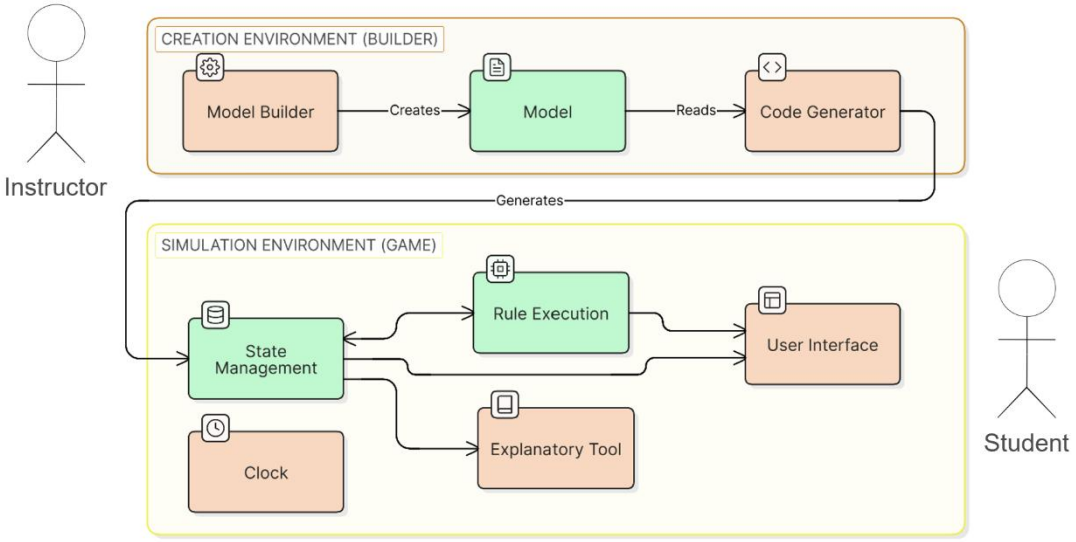


Figure 1: Overall architecture of SimSE (Adapted from [1]).

The SimSE portfolio consists of a game generator designed to build specific software engineering educational games and the six generated educational applications in 2024. These six applications correspond to distinct software engineering activities:

- A simulation of a requirements document inspection process,
- A simulation of a Extreme Programming (XP) development process,
- A simulation of a Rational Unified Process (RUP),
- A simulation of an Incremental development lifecycle,
- A simulation of a Prototyping phase, and
- A simulation of a Waterfall development lifecycle.

Each of these games is generated from a dedicated model specification, while relying on the same underlying execution infrastructure.

2.2 Creation Environment.

The Creation Environment comprises components responsible for defining and producing executable simulation instances. It includes both the Model Builder and the Generator, which are implemented within the same code repository and operate as a unified subsystem.

The resulting specification is stored as a model-definition file (MDL). This file constitutes a formal representation of a specific simulation scenario and serves as the input to the generator component. Each MDL file corresponds to a distinct simulation scenario and encapsulates the behavioral logic that is executed later in the Simulation Environment.

2.3 Simulation Environment.

The Simulation Environment represents the execution subsystem generated from a specified MDL specification. It is an interactive application that students engage in.

Although multiple simulations can be generated from different models, the execution infrastructure remains structurally consistent. Therefore, the runtime system combines stable engine components with model-specific behavioral logic derived from the MDL specification.

3 FUNCTIONAL USER REQUIREMENTS (FUR) OF THE GAMES GENERATOR.

Table 1 lists the set of 8 functional user requirements (FUR) identified in this game generator, together with their corresponding functional processes. For example, in Table 1, FUR1 includes 6 functional processes, FUR2 8 functional processes, and so on. In total, the SimSE game generator has 64 functional processes for its set of 8 FUR.

Table 1. SimSE Games Generator - 8 FUR with 64 Functional Processes.

FUR Id.	Functional Processes within a FUR
FUR1: Model Initialization	FP1-1 - File New: Initializes an empty model structure with default parameters. FP1-2 - File Open: Loads an existing model from a file into the application. FP1-3 - File Close: Closes the current model, prompting to save changes if necessary. FP1-4 - File Save: Saves the current model to its existing file location. FP1-5 - File Save As: Saves the current model to a new file location specified by the user. FP1-6 - Exit: Closes the application, prompting to save any unsaved changes.
FUR2: Object Type Definition	FP2-1 - Define New Object Type: Creates a new object type with default attributes. FP2-2 - Add Attribute: Adds a new attribute to an existing object type. FP2-3 - Edit Attribute: Modifies the properties of an existing attribute. FP2-4 - Remove Attribute: Deletes an attribute from an object type. FP2-5 - Rename Object Type: Changes the name of an existing object type. FP2-6- Remove Object Type: Deletes an object type from the model. FP2-7 - List Object Types: Displays all defined object types in the model.
FUR3: Initial State Configuration	FP3-1 - Start State Modify: Edits the starting values for object instances in the initial state.
FUR4: Action Specification	This function defines the possible events and activities within the simulation: FP4-1 – Create Actions: Defines a new action in the model. FP4-2 – Remove Actions: Deletes an existing action from the model. FP4-3 – Rename Actions: Changes the name of an existing action. FP4-4 - Move Up/Down Actions: Changes the order of actions in the model. FP4-5 - Add Participant: Adds a new participant to an action. FP4-6 - Edit Participant: Modifies the properties of an action participant. FP4-7 - Remove Participant: Deletes a participant from an action. FP4-8 - Move Up/Down Participant: Changes the order of participants within an action. FP4-9 - View Participant Action Options: Displays the configuration options for a participant action. FP4-10 - Edit Participant Action Options: Modifies the configuration options for a participant action.
FUR5: Rule Definition	FP5-1 - Add New Effect Rule: Creates a new effect rule for an action. FP5-2 - Add New Objects Rule: Defines a rule for creating new objects. FP5-3 - Add New Destroy Objects Rule: Defines a rule for destroying objects. FP5-4 – Configure Rule: Sets up the general properties of a rule. FP5-5 - View Rule: Displays the details of an existing rule. FP5-6 - Edit Rule: Modifies the properties and logic of an existing rule.

	FP5-7 - Rename Rule: Changes the name of an existing rule. FP5-8 - Remove Rule: Deletes a rule from the model. FP5-9 - View Effects: Displays the effects of a rule. FP5-10 - Edit Effects: Edit the effects of a rule. FP5-11 - View Button Pad: Displays the button pad used for rule creation. FP5-12 - Edit Button Pad: Modifies the button pad used for rule creation. FP5-13 - Add Rule Input information: Add information for a rule input. FP5-14 – Add Annotation: Adds explanatory notes to a rule.
FUR6: Graphical Configuration	FP6-1 - Graphics Choose an Image: Selects an image to represent an object or action. FP6-2 - Map: Defines the layout of the simulated environment.
FUR7: Execution Prioritization	FP7-1 - Triggers Prioritizer Update: Modifies the priority order of triggers. FP7-2 - Destroyers Prioritizer Update: Modifies the priority order of destroyers. FP7-3 - Continuous Rules Prioritizer Update: Modifies the priority order of continuous rules. FP7-4 - EstimateProject Trigger Rule Prioritizer Update: Updates priority for estimation triggers. FP7-5 - EndEstimate Trigger Rule Prioritizer Update: Updates priority for end estimation triggers. FP7-6 - Analyze Trigger Rule Prioritizer Update: Updates priority for analysis triggers. FP7-7 - Analyze Destroyer Rule Prioritizer Update: Updates priority for analysis destroyers
FUR8: Game Generation	FP8-1 - Generate the Model: Compiles the model into a playable simulation game. FP8-2 - File Edit (Icon Directory): Specifies the directory for icon storage. FP8-3 - File Edit (Code Generation Destination Directory): Sets the output directory for generated code. FP8-4 - Model Option Configuration: Configures general options for the model. FP8-5 View/edit Starting Narrative: Defines the introductory text for the simulation. FP8-6 - View Triggers: Displays existing triggers in the model. FP8-7 - Edit Triggers: Modifies properties of existing triggers. FP8-8 - Remove Triggers: Deletes triggers from the model. FP8-9 - Add New Triggers: Creates new triggers in the model. FP8-10 - Add New Destroyer: Creates new destroyers in the model. FP8-11 - View Existing Destroyers: Displays existing destroyers in the model. FP8-12 - Edit Destroyers: Modifies properties of existing destroyers. FP8-13 - View One Destroyers detail: Displays properties of existing destroyers. FP8-14 - View Action options: Displays properties of existing destroyers. FP8-15 - Edit Action options: Modifies properties of existing action options. FP8-16 - View Constraints: Displays existing constraints in the model. FP8-17 - View Checklist: Shows a checklist of model components or steps.

4 MEASUREMENT STRATEGY PHASE.

The COSMIC measurement strategy determines the following elements.

- The purpose of this COSMIC measurement is to establish a functional-size baseline for the SimSE portfolio and support future maintenance and evolution planning. Scope: The measurement focuses on functional processes from the instructor/model creator’s perspective.

Based on the Model Builder and Generator, six games were produced. Each game includes a common module, the Game Analyzer tool. Therefore, to avoid double counting, the total measurement scope consists of the Model Builder and Generator, the six generated games, and the Game Analyzer tool.

- Functional users:
  - Games Generator: The instructor/model creator.
  - Generated games and analyzer tool: The player/student.
- Granularity level: Functional processes identified for the instructor/model creator.
- Layer: A software layer is measured for each artifact (generator, analyzer tool, and generated game).

5 MAPPING PHASE.

The Mapping Phase concerns identification of the functional processes, objects of interest, data groups and data movements in the FUR. Due to the large size of the SimSE FUR, only a list of the functional processes and data movements is included in the following chapter.

6 MEASUREMENT PHASE.

6.1 Functional Size of the Games Generator.

Table 2 presents the list and measurement results of the 64 SimSE functional processes for a total functional size of 282 COSMIC Function Points (CFP). For each of these 64 functional processes, Table 2 also shows the number of CFP for the four data movement types (Entry, Read, Write and Exit) sized with the COSMIC measurement method. For the 'Generate the model' functional process (No. 48), 22 data groups are involved in, so its size is much bigger than others. The detailed measurements are provided in the Appendix.

Table 2. Functional Size of the Games Generator (N = 64 Functional Processes).

No	Functional processes of the Games Generator	Entry	Read	Write	Exit	Total CFP
1	File new	1	1	1	-	3
2	File open	1	1	-	2	4
3	File close	1	1	1	-	3
4	File save	1	-	1	-	2
5	File save as	1	-	1	-	2
6	Exit	1	-	1	-	2
7	Define new object type (name)	1	1	1	1	4
8	Add attribute	1	1	1	-	3
9	Edit attribute	1	1	1	-	3
10	Remove attribute	1	1	1	-	3
11	Rename object type	1	2	1	-	4
12	Remove object type	1	2	2	-	5

13	List of object type	1	1	-	1	3
14	Start State modify (edit starting value)	1	1	1	-	3
15	Create actions	1	1	1	-	3
16	Remove actions	1	1	1	-	3
17	Rename actions	1	1	1	-	3
18	Move up/down actions	1	1	1	1	4
19	Add participant	1	1	2	-	4
20	Edit participant	1	1	1	-	3
21	Remove participant	1	1	1		3
22	Move up/down participant	1	1	1	1	4
23	View participant action options	1	2	-	1	4
24	Edit participant action options	1	2	1	-	4
25	Add new effect rule	1	2	2	-	5
26	Add new create objects rule	1	2	2	-	5
27	Add new destroy objects rule	1	2	2	-	5
28	Configure rule	1	-	1	-	2
29	View rule	1	1	-	1	3
30	Edit rule	1	1	1	-	3
31	Rename rule	1	1	1	-	3
32	Remove rule	1	1	1	-	3
33	View effects	1	1	-	1	3
34	Edit effects	1	1	1		3
35	View Button Pad	1	1	-	1	3
36	Edit Button Pad	1	1	1	-	3
37	Add new rule input information	1	1	1	-	3
38	Add annotation	1	-	1	-	2
39	Choose image for graphics	1	1	-	1	3
40	View map	1	1	-	1	3
41	Triggers prioritizer update	1	1	1	1	4
42	Destroyers prioritizer update	1	1	1	1	4
43	Continuous rules prioritizer update	1	1	1	1	4
44	EstimateProject trigger rule prioritizer update	1	1	1	1	4
45	EndEstimate trigger rule prioritizer update	1	1	1	1	4
46	Analyze trigger rule prioritizer update	1	1	1	1	4
47	Analyze destroyer rule prioritizer update	1	1	1	1	4
48	Generate the model	1	22	22	22	67
49	File edit (Icon directory)	1	1	1	1	4

50	File edit (Code generation destination directory)	1	1	-	1	3
51	Model option configuration	1		-	1	2
52	Starting narrative	1	1	-	2	4
53	View triggers	1	2	-	1	4
54	Edit triggers	1	2	1	-	4
55	Remove triggers	1	1	1	-	3
56	Add new triggers	1	2	2	-	5
57	Add new destroyers	1	1	2	-	4
58	View existing destroyers	1	2	-	1	4
59	Edit destroyers	1	2	1	-	4
60	View one destroyer detail	1	1	-	1	3
61	View action options	1	1	-	1	3
62	Edit action options	1	1	1	-	3
63	View constraints	1	1	-	1	3
64	View Checklist	1	1	-	1	3
	Total size	**64**	**91**	**75**	**52**	**282**

In this study, the data movements comprise 64 Entries, 91 Reads, 75 Writes, and 52 Exits.

6.2 Functional Size of the Six Generated Games.

In 2024 the SimSE portfolio included six educational games related to software engineering activities:

1. An inspection process of a software requirements document.
2. An extreme programming (e.g., XP) development process.
3. A Rational Unified Process (RUP) development process.
4. An incremental development lifecycle.
5. A prototyping development phase.
6. A waterfall development lifecycle.

Table 3 presents the 22 functional processes identified for the Inspection game, together with their corresponding number of data movements by data movement type.

Table 3. Functional Size of the Inspection Game (N = 22 Functional Processes).

No	Functional Process	Entry	Read	Write	Exit	CFP size
1	Graphic with employees	1	1	-	1	3
2	Employee description	1	2	-	2	5
3	Artefacts description	1	2	-	2	5
4	Project description	1	2	-	2	5
5	Choose participant	1	2	1	-	4
6	Choose artefact code	1	2	1	-	4
7	Choose page	1	2	1	-	4

8	Tools description	1	2	-	2	5
9	Next event	1	1	-	1	3
10	Time elapsed	1	1	-	1	3
11	Advance click	1	1	1	1	4
12	No. of ticks	1	1	1	1	4
13	Message (found bugs, etc)	1	1	1	1	4
14	End game	1	1	1	1	4
15	Generate object graph	1	1	-	1	3
16	Generate action graph	1	1	-	1	3
17	Composite graph	1	1	-	1	3
18	Trigger rules	1	1	-	1	3
19	Destroy rules	1	1	-	1	3
20	Implementation rules	1	1	1	1	4
21	Actions	1	1	-	1	3
22	Your score	1	1	-	1	3
	Total size	**22**	**29**	**8**	**23**	**82**

The respective functional sizes of all six educational games are presented in Table 4, with sizes ranging from 82 CFP for the Inspection game to 91 CFP for the Waterfall game. It represents the functional size of the SimSE portfolio, applying different types of applications (Builder/Generator, generated games and an analyzer) that may require different levels of effort to produce. This table in its current form cannot be used to draw conclusions on effort.

Table 4. Functional size of the six educational games (2024).

Game Name	Entry	Read	Write	Exit	Total
Inspection	22	29	8	23	82 CFP
XP	24	31	8	25	88 CFP
RUP	24	32	8	26	90 CFP
Incremental	23	30	8	24	85 CFP
Rapid Prototyping	24	31	8	25	88 CFP
Waterfall	24	32	9	26	91 CFP
Total size	**141**	**185**	**49**	**149**	**524 CFP**

6.3 Functional Size of the Games Analyzer Tool.

The Games Analyzer software tool was used for six educational games. It consists of the 11 functional processes listed in Table 5, together with their corresponding numbers of data movements for a total size of 49 CFP.

Table 5. Games Analyzer Tool – 11 Functional Processes.

No.	Functional Process	Entry	Read	Write	Exit	Functional Size
1	Object group	1	1	-	1	3 CFP
2	Show attributes	1	1	-	1	3 CFP
3	Generate object graph	1	2	-	2	5 CFP
4	Action graph	1	1	-	1	3 CFP
5	Generate action graph	1	2	-	2	5 CFP
6	Generate composite graph	1	3	-	3	7 CFP
7	Action (list)	1	1	-	1	3 CFP
8	View trigger rules	1	2	-	2	5 CFP
9	View destroyer rules	1	2	-	2	5 CFP
10	View intermediate rules	1	3	-	3	7 CFP
11	Close	1	1	-	1	3 CFP
	Total SIZE	**11**	**19**	**-**	**19**	**49 CFP**

6.4 Measurement Summary.

Table 6. Total functional size of the 2024 SimSE portfolio.

Component	Functional Size
Model Builder and Generator	280 CFP
Six Generated Games	524 CFP
Game Analyzer Tool	49 CFP
Total functional size	**853 CFP**

7 REFERENCES AND DOCUMENTATION.

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APPENDIX.

Table A1. Functional size of FUR1 in Game Generator (6 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR1-1	File new	File information	File	E	1
		File information	File	R	1
		File information	File	X	1
FUR1-2	File open	File information	File	E	1
		File information	File	R	1
		File information	File	X	1
		E/C message	E/C message	X	1
FUR1-3	File close	File information	File	E	1
		File information	File	W	1
FUR1-4	File save	File information	File	E	1
		File information	File	W	1
FUR1-5	File save as	File information	File	E	1
		File information	File	W	1
FUR1-6	Exit	File information	File	E	1
		File information	File	W	1
Total					**15**

Table A2. Functional size of FUR2 in Game Generator (7 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR2-1	Define new object type	Object information	Object	E	1
		Object information	Object	R	1
		Object information	Object	W	1
		E/C message	E/C message	X	1
FUR2-2	Add attribute	Attribute information	Attribute	E	1
		Attribute information	Attribute	R	1
		Attribute information	Attribute	W	1
		Attribute information	Attribute	X	1
FUR2-3	Edit attribute	Attribute information	Attribute	E	1
		Attribute information	Attribute	R	1
		Attribute information	Attribute	W	1
		Attribute information	Attribute	X	1
FUR2-4	Rename attribute	Attribute information	Attribute	E	1
		Attribute information	Attribute	R	1
		Attribute information	Attribute	W	1

		Attribute information	Attribute	X	1
FUR2-5	Rename object type	Object type information	Object	E	1
		Object type information	Object	R	1
		Object type information	Object	W	1
		Object type information	Object	X	1
FUR2-6	Remove object type	Object type information	Object	E	1
		Object type information	Object	W	1
		Object type information	Object	X	1
FUR2-7	List object type	Object type information	Object	E	1
		Object type information	Object	R	1
		Object type information	Object	X	1
Total					**26**

Table A3. Functional size of FUR3 in Game Generator (1 Functional Process).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR3-1	Start State modify	Start State information	Start State	E	1
		Start State information	Start State	R	1
		Start State information	Start State	W	1
		Start State information	Start State	X	1
Total					**4**

Table A4. Functional size of FUR4 in Game Generator (10 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR4-1	Create actions	Action information	Action	E	1
		Action information	Action	R	1
		Action information	Action	W	1
		Action information	Action	X	1

FUR4-2	Remove actions	Action information	Action	E	1
		Action information	Action	W	1
		Action information	Action	X	1
FUR4-3	Rename actions	Action information	Action	E	1
		Action information	Action	R	1
		Action information	Action	W	1
		Action information	Action	X	1
FUR4-4	Move up/down actions	Action information	Action	E	1
		Action information	Action	W	1
		Updated Action list	Action	X	1
FUR4-5	Add participant	Participant information	Participant	E	1
		Participant information	Participant	R	1
		Participant information	Participant	W	1
		E/C message	E/C message	X	1
FUR4-6	Edit participant	Participant information	Participant	E	1
		Participant information	Participant	R	1
		Participant information	Participant	W	1
		Participant information	Participant	X	1
FUR4-7	Remove participant	Participant information	Participant	E	1
		Participant information	Participant	W	1
		Participant information	Participant	X	1
FUR4-8	Move up/down participant	Participant information	Participant	E	1
		Participant information	Participant	W	1
		Updated Participant information	Participant	X	1
FUR4-9	View participant action options	Action information	Action	E	1
		Action information	Action	R	1
		Action information	Action	X	1
FUR4-10	Edit participant action options	Action information	Action	E	1
		Action information	Action	R	1
		Action information	Action	W	1
		Action information	Action	X	1
Total					**35**

Table A5. Functional size of FUR5 in Game Generator (14 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR5-1	Add new effect rule	Effect Rule information	Effect rule	E	1
		Effect Rule information	Effect rule	R	1
		Effect Rule information	Effect rule	W	1
FUR5-2	Add new objects rule	Objects rule information	Objects rule	E	1
		Objects rule information	Objects rule	R	1
		Objects rule information	Objects rule	W	1
FUR5-3	Add new destroy rule	Destroy rule information	Destroy rule	E	1
		Destroy rule information	Destroy rule	R	1
		Destroy objects information	Destroy rule	W	1
FUR5-4	Configure rule	Rule configuration information	Rule	E	1
		Rule configuration information	Rule	W	1
FUR5-5	View rule	Rule information	Rule	E	1
		Rule information	Rule	R	1
		Rule information	Rule	X	1
FUR5-6	Edit rule	Rule information	Rule	E	1
		Rule information	Rule	R	1
		Rule information	Rule	W	1
		Updated Rule information	Rule	X	1
FUR5-7	Rename rule	Rule information	Rule	E	1
		Rule information	Rule	R	1
		Rule information	Rule	W	1
		Updated Rule information	Rule	X	1
FUR5-8	Remove rule	Rule information	Rule	E	1
		Rule information	Rule	W	1
		Updated Rule information	Rule	X	1
FUR5-9	View effects	Effect information	Effect	E	1
		Effect information	Effect	R	1
		Effect information	Effect	X	1
FUR5-10	Edit effects	Effect information	Effect	E	1

		Effect information	Effect	R	1
		Effect information	Effect	W	1
		Effect information	Effect	X	1
FUR5-11	View Button Pad	Button Pad information	Button Pad	E	1
		Button Pad information	Button Pad	R	1
		Button Pad information	Button Pad	X	1
FUR5-12	Edit Button Pad	Button Pad information	Button Pad	E	1
		Button Pad information	Button Pad	R	1
		Button Pad information	Button Pad	W	1
		Button Pad information	Button Pad	X	1
FUR5-13	Add new rule input	Rule input information	Rule	E	1
		Rule input information	Rule	R	1
		Rule input information	Rule	W	1
FUR5-14	Add annotation	Annotation information	Annotation	E	1
		Annotation information	Annotation	W	1
Total					**44**

Table A6. Functional size of FUR6 in Game Generator (2 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR6-1	Choose image for graphics	Image information	Image	E	1
		Image information	Image	R	1
		Image information	Image	X	1
FUR6-2	View map	Map information	Map	E	1
		Map information	Map	R	1
		Map information	Map	X	1
Total					**6**

Table A7. Functional size of FUR7 in Game Generator (6 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR7-1	Triggers prioritizer update	Trigger prioritizer information	Trigger	E	1
		Trigger prioritizer information	Trigger	R	1
		Trigger prioritizer information	Trigger	W	1
		Trigger prioritizer information	Trigger	X	1
FUR7-2	Destroyers prioritizer update	Destroyers prioritizer information	Destroyers	E	1
		Destroyers prioritizer information	Destroyers	R	1
		Destroyers prioritizer information	Destroyers	X	1
		Destroyers prioritizer information	Destroyers	W	1
FUR7-3	Continuous rules prioritizer update	Continuous rules prioritizer list	Continuous rules	E	1
		Continuous rules prioritizer information	Continuous rules	R	1
		Continuous rules prioritizer information	Continuous rules	W	1
		Continuous rules prioritizer information	Continuous rules	X	1
FUR7-4	EPT rule prioritizer update	EPT rule information	EPT rules	E	1
		EPT rule information	EPT rules	R	1
		EPT rule information	EPT rules	W	1
		EPT rule information	EPT rules	X	1
FUR7-5	EET rule prioritizer update	EET rule information	EET rules	E	1
		EET rule information	EET rules	R	1
		EET rule information	EET rules	W	1
		EET rule information	EET rules	X	1
FUR7-6	AT rule prioritizer update	AT rule information	AT rules	E	1
		AT rule information	AT rules	R	1
		AT rule information	AT rules	W	1
		AT rule information	AT rules	X	1
FUR7-7	AD rule prioritizer update	AD rule information	AD rules	E	1
		AD rule information	AD rules	R	1
		AD rule information	AD rules	W	1
		AD rule information	AD rules	X	1
Total					**28**

Note 1: EPT refers to EstimateProject trigger.

Note 2: EET refers to EndEstimate trigger.

Note 3: AT refers to Analyze trigger.

Note 4: AD refers to Analyze destroyer.

Table A8. Functional size of FUR8 in Game Generator (6 Functional Processes).

No	Functional Process	Data Group	Object of Interest	Data Movement	CFP
FUR8-1	Generate the model*	Generate instruction	Generating	E	1
		22 DG	22 OOI	R	22
		22 DG	22 OOI	W	22
		22 DG	22 OOI	X	22
FUR8-2	File edit icon directory	File information	File	E	1
		File information	File	R	1
		File information	File	W	1
		E/C message	E/C message	X	1
FUR8-3	File edit code generation	File information	File	E	1
		File information	File	R	1
		File information	File	W	1
		E/C message	E/C message	X	1
FUR8-4	Model option configuration	Model information	Model	E	1
		Model information	Model	W	1
FUR8-5	View/edit Starting narrative	Narrative information	Narrative	E	1
		Narrative information	Narrative	R	1
		Narrative information	Narrative	W	1
		Narrative information	Narrative	X	1
FUR8-6	View triggers	Trigger information	Triggers	E	1
		Trigger information	Triggers	R	1
		Trigger information	Triggers	X	1
FUR8-7	Edit triggers	Trigger information	Triggers	E	1
		Trigger information	Triggers	R	1
		Trigger information	Triggers	X	1
		Trigger information	Triggers	W	1
FUR8-8	Remove triggers	Trigger information	Triggers	E	1
		Trigger information	Triggers	W	1
		Trigger information	Triggers	X	1

FUR8-9	Add new triggers	Trigger information	Triggers	E	1
		Trigger information	Triggers	R	1
		Trigger information	Triggers	W	1
		Trigger information	Triggers	X	1
FUR8-10	Add new destroyers	Destroyers information	Destroyers	E	1
		Destroyers information	Destroyers	R	1
		Destroyers information	Destroyers	W	1
		Destroyers information	Destroyers	X	1
FUR8-11	View existing destroyers	Destroyers information	Destroyers	E	1
		Destroyers information	Destroyers	R	1
		Destroyers information	Destroyers	X	1
FUR8-12	Edit destroyers	Destroyers information	Destroyers	E	1
		Destroyers information	Destroyers	R	1
		Destroyers information	Destroyers	W	1
		Destroyers information	Destroyers	X	1
FUR8-13	View one destroyer detail	Destroyers information	Destroyers	E	1
		Destroyers information	Destroyers	R	1
		Destroyers information	Destroyers	X	1
FUR8-14	View action options	Options information	Options	E	1
		Options information	Options	R	1
		Options information	Options	X	1
FUR8-15	Edit action options	Options information	Options	E	1
		Options information	Options	R	1
		Options information	Options	W	1
		Options information	Options	X	1
FUR8-16	View constraints	Constraints information	Constraints	E	1
		Constraints information	Constraints	R	1
		Constraints information	Constraints	X	1

FUR8-17	View checklist	Checklist information	Checklist	E	1
		Checklist information	Checklist	R	1
		Checklist information	Checklist	X	1
Total					**122**

Generate the model contains 22 different data groups (generators), which are

Engine, ActionGraph, ExplanatoryTool, MultipleTimelinesBrowser, ObjectGraph, AtAGlanceFrames, AtAGlanceTableModel, AttributePanel, SimSEMap, TabPanel, DestroyerChecker, MenuInputManager, MiscUpdater, RuleExecutor, TriggerChecker, ChooseActionToDestroyDialog, ChooseActionToJoinDialog, ChooseRoleToPlayDialog, EmployeeParticipantSelection, NonEmployeeParticipantSelectionDialog, ParticipantSelectionDialogs-Driver, Repository.