

## Appendix

### A.1 Description of the Participants (EI)

| ID  | Job Role                           | Region | Industry                   | Size of organization | Years of EAM experience |
|-----|------------------------------------|--------|----------------------------|----------------------|-------------------------|
| P1  | Senior Enterprise Architect        | US     | Software Development       | 5000-20.000          | 15                      |
| P2  | Principal Consultant EA            | US     | IT Services                | 10-49                | 15                      |
| P3  | Senior IT Advisor                  | US     | Automotive / Finance       | 250-4999             | 13                      |
| P4  | Lead Architecture Management (CTO) | CH     | Government                 | 5000-20.000          | 11                      |
| P5  | Enterprise Architect               | GER    | Telecommunication Services | 0-1                  | 30                      |
| P6  | IT Senior Designer                 | ROU    | Telecommunication Services | 250 - 4999           | 10                      |
| P7  | Program Lead Carve Out Project     | GER    | Automobiles & Components   | 5000 – 20.000        | 10                      |
| P8  | Enterprise Architect               | GER    | Defense Industry           | 250-4999             | 20                      |
| P9  | CEO & Enterprise Architect         | GER    | Retailing                  | 2-9                  | 25                      |
| P10 | IT Infrastructure Management       | AUT    | Food, Beverage & Tobacco   | 5000-20.000          | 8                       |
| P11 | Partner                            | GER    | Software & Services        | 50-249               | 11                      |
| P12 | Enterprise Architect               | GER    | Media & Entertainment      | 2-9                  | 7                       |
| P13 | Enterprise IT Architect            | GER    | Banks                      | 250-4999             | 10                      |
| P14 | IT-Consultant EAM                  | GER    | Consultancy / Automotive   | 10-49                | 5                       |
| P15 | Senior Solution Architect          | GER    | Software & Services        | 5000–20.000          | 6                       |
| P16 | Enterprise Architect               | NLD    | Government                 | > 20.000             | 5                       |
| P17 | Enterprise Architect               | CHL    | Software & Services        | 250 - 4999           | 5                       |
| P18 | Enterprise Architect               | NLD    | Banks                      | 5000 - 20.000        | 7                       |
| P19 | Enterprise Architect               | US     | Retailing                  | > 20.000             | 15                      |
| P20 | Enterprise Architect               | KAZ    | Software & Services        | > 20.000             | 9                       |
| P21 | Enterprise Architect               | NLD    | Utilities                  | 5000 - 20.000        | 14                      |
| P22 | Enterprise Architect               | FRA    | Banks                      | > 20.000             | 10                      |

|     |                                               |     |                              |               |    |
|-----|-----------------------------------------------|-----|------------------------------|---------------|----|
| P23 | IT Architect                                  | SVK | Banks                        | 250 - 4999    | 6  |
| P24 | Enterprise Architect                          | US  | Insurance                    | > 20.000      | 15 |
| P25 | Enterprise Architect                          | NLD | Software & Services          | 50 - 249      | 15 |
| P26 | Consulting Enterprise Architect               | IRL | Banks                        | 5000 - 20.000 | 14 |
| P27 | Enterprise Architect                          | GER | IT Consulting, Public Sector | > 20.000      | 12 |
| P28 | Director of Architecture, Design, and Process | COL | Transportation               | 5000 - 20.000 | 10 |

### A.2 Description of the Participants (Online Survey)

| ID  | Viewpoints                    | Region      | Size of organization in employees | EAM experience in years |
|-----|-------------------------------|-------------|-----------------------------------|-------------------------|
| 77  | Business Architect            | USA         | 0 - 1                             | 7                       |
| 86  | Business Architect            | Ireland     | 5000 - 20.000                     | 15                      |
| 87  | Information Systems Architect | Germany     | 250 - 4999                        | 7                       |
| 88  | Information Systems Architect | Germany     | 5000 - 20.000                     | 7                       |
| 90  | Information Systems Architect | Romania     | 10 – 49                           | 10                      |
| 91  | Technical Architect           | USA         | 10 – 49                           | 15                      |
| 92  | Enterprise Architect          | Netherlands | 250 – 4999                        | 8                       |
| 93  | Enterprise Architect          | Germany     | 250 – 4999                        | 20                      |
| 94  | Enterprise Architect          | USA         | > 20.000                          | 15                      |
| 95  | Business Architect            | Germany     | 50 – 249                          | 9                       |
| 96  | Business Architect            | Germany     | > 20.000                          | 10                      |
| 97  | Information Systems Architect | Netherlands | 50 – 249                          | 15                      |
| 98  | IT Infrastructure Management  | Austria     | 5000 - 20.000                     | 10                      |
| 99  | Technical Architect           | USA         | 5000 - 20.000                     | 15                      |
| 101 | Technical Architect           | Netherlands | > 20.000                          | 8                       |
| 102 | Information Systems Architect | Germany     | > 20.000                          | 10                      |
| 103 | Lead Enterprise Architect     | Switzerland | 5000 - 20.000                     | 12                      |

### A.3 Clustered Analysis Dimensions

|                      | Knowledge Mgmt. | Innovation | Technology | Processes | Market Access | Culture | Governance | Strategy | Expandability | Monolithic Dimension |
|----------------------|-----------------|------------|------------|-----------|---------------|---------|------------|----------|---------------|----------------------|
| [Saputra et al., 19] |                 |            |            |           | x             | x       | x          | x        |               |                      |

|                               |          |          |           |           |          |           |           |           |          |          |
|-------------------------------|----------|----------|-----------|-----------|----------|-----------|-----------|-----------|----------|----------|
| [Gollhardt et al., 20]        |          |          | x         |           |          | x         | x         | x         |          |          |
| [Werner and Kosacka, 19]      |          |          |           |           |          |           |           |           |          | x        |
| [Rafael et al., 20]           |          |          | x         |           |          | x         | x         | x         |          |          |
| [Jansen, 20]                  | x        | x        | x         |           | x        | x         | x         |           |          |          |
| [Alves et al., 11]            |          |          |           |           |          |           |           |           |          | x        |
| [Cukier and Kon, 18]          | x        | x        | x         |           | x        | x         | x         |           | x        |          |
| [De Carolis et al., 17]       |          |          | x         | x         |          |           | x         |           |          |          |
| [Adrodegari and Saccani, 20]  |          |          |           | x         |          | x         | x         | x         |          |          |
| [Cukier et al., 20]           |          | x        |           |           |          | x         | x         |           |          |          |
| [Mohamed, 20]                 |          | x        | x         |           |          | x         | x         | x         |          |          |
| [Cancian et al., 20]          |          | x        | x         | x         | x        |           | x         | x         |          |          |
| [Kreiling and Bounfour, 19]   | x        | x        |           |           |          | x         |           |           | x        |          |
| [Wagire et al., 20]           |          |          | x         | x         |          | x         | x         | x         |          |          |
| [Lin et al., 20]              |          |          | x         | x         |          |           | x         |           |          |          |
| [Donker and van Loenen, 17]   |          |          | x         |           |          | x         | x         | x         |          |          |
| [Azevedo, 19]                 | x        | x        |           | x         |          | x         | x         |           |          |          |
| [Enkel et al., 20]            |          |          | x         | x         | x        |           |           | x         | x        |          |
| [von Solms and Langerman, 21] | x        |          | x         | x         |          |           | x         |           |          |          |
| [Lin and Wang, 21]            | x        |          |           | x         |          |           | x         |           |          |          |
| [Gökalp and Martinez, 21a]    | x        |          | x         | x         |          |           | x         | x         |          |          |
| [Gökalp and Martinez, 21b]    | x        |          | x         | x         |          |           | x         | x         |          |          |
| <b>Sum</b>                    | <b>8</b> | <b>7</b> | <b>14</b> | <b>11</b> | <b>5</b> | <b>12</b> | <b>18</b> | <b>11</b> | <b>3</b> | <b>2</b> |

#### A.4 Results of the Maturity Model Application

| Industry Sector | Transparency | Governance | Expandability | Cybersecurity | Knowledge base | Reusability | Standardization | Total | Maturity Rank |
|-----------------|--------------|------------|---------------|---------------|----------------|-------------|-----------------|-------|---------------|
|-----------------|--------------|------------|---------------|---------------|----------------|-------------|-----------------|-------|---------------|

|                                          |          |          |          |          |          |          |          |      |    |
|------------------------------------------|----------|----------|----------|----------|----------|----------|----------|------|----|
| Transformation Consulting                | 5        | 5        | 2        | 5        | 5        | 5        | 2.5      | 29.5 | 1  |
| Software & Services                      | 5        | 4        | 3        | 4.5      | 4.5      | 3.5      | 4        | 28.5 | 2  |
| Defence & Security                       | 4        | 4.5      | 3        | 4        | 3        | 3.5      | 4        | 26   | 3  |
| Government & Public Services             | 4        | 3        | 2.5      | 5        | 3        | 3.5      | 4.5      | 25.5 | 4  |
| Software & Services                      | 4        | 3.5      | 2.5      | 4.5      | 3.5      | 3.5      | 4        | 25.5 | 5  |
| Food, Beverage & Tobacco                 | 5        | 5        | 2        | 5        | n.a.     | 3.5      | 4        | 24.5 | 6  |
| Telecommunication Services               | 3.5      | 3.5      | 3.5      | 3.5      | 3        | 3.5      | 3        | 23.5 | 7  |
| Semiconductors & Semiconductor Equipment | 3.5      | 3.5      | 2.5      | 3        | 3.5      | 3        | 3        | 22   | 8  |
| Banks                                    | 3.5      | 3.5      | 2        | 4        | 3        | 2        | 2.5      | 20.5 | 9  |
| Banks                                    | 3.5      | 3        | 3.5      | 4        | 1        | 3        | 2.5      | 20.5 | 10 |
| Banks                                    | 3        | 3        | 2        | 4        | 2.5      | 3        | 2.5      | 20   | 11 |
| Software & Services                      | 3.5      | 3        | 2        | 3        | 3.5      | 3        | 2        | 20   | 12 |
| Media & Entertainment                    | 3.5      | 2.5      | 2.5      | 3.5      | 2.5      | 2.5      | 3        | 20   | 13 |
| Insurance                                | 3        | 2        | 3.5      | 3        | 2        | 3.5      | 2        | 19   | 14 |
| Software & Services                      | 3.5      | 3.5      | 2.5      | 2        | 2        | 3        | 2.5      | 19   | 15 |
| Insurance                                | 2.5      | 2.5      | 2.5      | 4.5      | 2        | 3        | 2        | 19   | 16 |
| Education                                | 4        | 3        | 2.5      | 2.5      | 1        | 3        | 2        | 18   | 17 |
| Total                                    | 64       | 58       | 44       | 65       | 45       | 55       | 50       |      |    |
| Standard Deviation                       | 0.69     | 0.81     | 0.52     | 0.87     | 1.06     | 0.60     | 0.82     |      |    |
| <b>Dimension Rank</b>                    | <b>2</b> | <b>3</b> | <b>7</b> | <b>1</b> | <b>6</b> | <b>4</b> | <b>5</b> |      |    |

### A.5 GQM Questions

| Issue: Transparency |                               | ID  | GQM Question                                                                                                                   | GQM Metric                  |
|---------------------|-------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Viewpoint           | Business Architect            | TB1 | (6/21) To what extend is transparency on business strategies, models, and overarching processes provided to you in your DBE?   | Degree of transparency in % |
|                     |                               | TB2 | (7/21) What proportion of transparency on the available and consumable business services is given to you in your organization? | Degree of transparency in % |
| Viewpoint           | Information Systems Architect | TI1 | (6/21) What proportion of processed information (information objects and their provenance) is known to you in your DBE?        | Degree of transparency in % |
|                     |                               | TI2 | (7/21) To what extend is the DBE application landscape transparent to you in your organization?                                | Degree of transparency in % |
| Viewpoint           | Technology Architect          | TT1 | (6/21) What proportion of used technical architecture components (cloud resources, interface protocols, encryption standards,  | Degree on transparency in % |

|  |  |     |                                                                                                                                                                                |                             |
|--|--|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|  |  |     | access mechanisms) is transparent to you in your DBE?                                                                                                                          |                             |
|  |  | TT2 | (7/21) To what extent the planned changes (e.g., upgrade of servers) in the technical architecture are transparent to the participating enterprises' stakeholders in your DBE? | Degree on transparency in % |

| Issue: Governance |                               | ID  | GQM Question                                                                                                                                                | GQM Metric                                              |
|-------------------|-------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Viewpoint         | Business Architect            | GB1 | (8/21) To what extent a steering committee (e.g., Inter-enterprise management board) is making decisions concerning a common DBE strategy?                  | Degree of joint decision making in %                    |
|                   |                               | GB2 | (9/21) How much consider the IT governance activities such as business-IT alignments and IT project management a joint DBE business system planning?        | Degree of consideration in %                            |
| Viewpoint         | Information Systems Architect | GI1 | (8/21) To what extent a DBE IT steering function aligns the application developments with the DBE strategy?                                                 | Degree of alignment in %                                |
|                   |                               | GI2 | (9/21) How much consider the IT governance activities such as business-IT alignments and IT project management a DBE overall release and change management? | Consideration of DBE release and change management in % |
| Viewpoint         | Technology Architect          | GT1 | (8/21) To what extent an infrastructure steering committee aligns significant infrastructure changes with stakeholders of each enterprise?                  | The intensity of alignment in %                         |
|                   |                               | GT2 | (9/21) How much consider the IT demand management a DBE overall strategy?                                                                                   | Consideration of DBE demand management in %             |

| Issue: Expandability |                               | ID  | GQM Question                                                                                                             | GQM Metric                |
|----------------------|-------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Viewpoint            | Business Architect            | EB1 | (10/21) How is the complexity of adding new partner-enterprises to the DBE?                                              | Degree of simplicity in % |
|                      |                               | EB2 | (11/21) How is the complexity of adding new business models or services to the DBE?                                      | Degree of simplicity in % |
| Viewpoint            | Information Systems Architect | EI1 | (10/21) How is the complexity of extending the application landscape to involve new partner-enterprises?                 | Degree of simplicity in % |
|                      |                               | EI2 | (11/21) To what extent the application landscape can integrate legacy systems?                                           | Degree of simplicity in % |
| Viewpoint            | Technology Architect          | ET1 | (10/21) How is the complexity of extending and upscaling the infrastructure resources (e.g., servers, network, storage)? | Degree of simplicity in % |
|                      |                               | ET2 | (11/21) To what extent the infrastructure landscape can integrate legacy systems?                                        | Degree of simplicity in % |

| Issue: Cybersecurity |                    | ID  | GQM Question                                                                                                                                                  | GQM Metric               |
|----------------------|--------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Viewpoint            | Business Architect | CB1 | (12/21) How much a data privacy function such as the "data protection officer" influences the fulfillment of compliance with legal requirements such as GDPR? | Degree of influence in % |

|                  |                               |     |                                                                                                                                                               |                            |
|------------------|-------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|                  |                               | CB2 | (13/21) To what extent a security function such as the security officer conducts security assessments?                                                        | Degree of assessments in % |
| <b>Viewpoint</b> | Information Systems Architect | CI1 | (12/21) How much a data privacy function such as the "data protection officer" influences the fulfillment of compliance with legal requirements such as GDPR? | Degree of influence in %   |
|                  |                               | CI2 | (13/21) To what extent does a security function such as the security officer conduct security assessments in the distributed application landscape of a DBE?  | Degree of assessments in % |
| <b>Viewpoint</b> | Technology Architect          | CT1 | (12/21) How much a data privacy function such as the "data protection officer" influences the fulfillment of compliance with legal requirements such as GDPR? | Degree of influence in %   |
|                  |                               | CT2 | (13/21) To what extent does a security function such as the security officer conduct security assessments in the distributed infrastructure of a DBE?         | Degree of assessments in % |

| <b>Issue: Knowledge base</b> |                               | <b>ID</b> | <b>GQM Question</b>                                                                                                                                                             | <b>GQM Metric</b>               |
|------------------------------|-------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Viewpoint</b>             | Business Architect            | KB1       | (14/21) To what extent a DBE knowledge base (e.g., online repository) exists that describes the business models, processes, capabilities, and dependencies?                     | Coverage of knowledge base in % |
|                              |                               | KB2       | (15/21) How frequently the DBE knowledge base is used and maintained?                                                                                                           | Quality of knowledge base in %  |
| <b>Viewpoint</b>             | Information Systems Architect | KI1       | (14/21) To what extent a DBE knowledge base (e.g., online repository) exists that describes the application landscape (including interfaces and processed information objects)? | Coverage of knowledge base in % |
|                              |                               | KI2       | (15/21) How frequently the DBE knowledge base is used and maintained?                                                                                                           | Quality of knowledge base in %  |
| <b>Viewpoint</b>             | Technology Architect          | KT1       | (14/21) To what extent a DBE knowledge base (e.g., online repository) exists that describes the infrastructure components (e.g., server, network, storage)?                     | Coverage of knowledge base in % |
|                              |                               | KT2       | (15/21) How frequently the DBE knowledge base is used and maintained?                                                                                                           | Quality of knowledge base in %  |

| <b>Issue: Reusability</b> |                               | <b>ID</b> | <b>GQM Question</b>                                                                                                                                                   | <b>GQM Metric</b>            |
|---------------------------|-------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Viewpoint</b>          | Business Architect            | RB1       | (16/21) How complicated is the reuse of existing business services and processes (e.g., available-to-promise process, order-to-cash process) for partner-enterprises? | Degree of complexity in %    |
|                           |                               | RB2       | (17/21) To what extent the reuse of existing business services and processes is considered in the business strategy?                                                  | Degree of consideration in % |
| <b>Viewpoint</b>          | Information Systems Architect | RI1       | (16/21) To what extent existing interfaces (e.g., microservices, web services, file-based interfaces) are reusable for partner-enterprises?                           | Degree of reusability in %   |

|                  |                      |     |                                                                                                                                                                                                |                            |
|------------------|----------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|                  |                      | RI2 | (17/21) What portion of existing software solutions (e.g., ERP-, SCM-, CRM systems) are reusable for partner-enterprises?                                                                      | Degree of reusability in % |
| <b>Viewpoint</b> | Technology Architect | RT1 | (16/21) What portion of existing infrastructure components (cloud platforms, data centers, IT-service-management ticket platform, network scanner tools) are reusable for partner-enterprises? | Degree of reusability in % |
|                  |                      | RT2 | (17/21) To what extent the reuse of existing IT platforms (e.g., IT-service-management ticket platform) is considered in the IT strategy?                                                      | Degree of feasibility in % |

| <b>Issue: Standardization</b> |                               | <b>ID</b> | <b>GQM Question</b>                                                                                                                                            | <b>GQM Metric</b>              |
|-------------------------------|-------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Viewpoint</b>              | Business Architect            | SB1       | (18/21) To what extent the business processes (e.g., joint customer complaint management process) are standardized together with partner-enterprises of a DBE? | Degree of standardization in % |
|                               |                               | SB2       | (19/21) What portion of offered co-created services and products are standardized across the DBE?                                                              | Degree of standardization in % |
| <b>Viewpoint</b>              | Information Systems Architect | SI1       | (18/21) To what extent the information exchange via interfaces are standardized (e.g., usage of microservices, middleware technologies, etc.)?                 | Degree of standardization in % |
|                               |                               | SI2       | (19/21) What portion of deployed software solutions is standardized across the DBE (e.g., every enterprise uses the same CRM system)?                          | Degree of standardization in % |
| <b>Viewpoint</b>              | Technology Architect          | ST1       | (18/21) What portion of used infrastructure components follows standards for interoperability?                                                                 | Degree of standardization in % |
|                               |                               | ST2       | (19/21) To what extent new infrastructure components are standardized across the DBE?                                                                          | Degree of standardization in % |

| <b>Issue: Feedback</b>      |               | <b>ID</b> | <b>GQM Question</b>                                                                                                                            |
|-----------------------------|---------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Viewpoints</b>           | All           |           |                                                                                                                                                |
| <b>Evaluation Dimension</b> | Usefulness    | FB1       | Does the model enable comparing and assessing the maturity of existing DBEs?                                                                   |
|                             |               | FB2       | Is the maturity model applicable straightforwardly and provides the assessment result quickly?                                                 |
|                             | Quality       | FB3       | Does the maturity model application help identify areas for improvement in the collaboration within DBEs by considering multiple perspectives? |
|                             |               | FB4       | Does a repeated application of the maturity model provide an understanding of how DBEs emerge and which maturity levels they surpass?          |
|                             |               | FB5       | Which dimensions are missing to achieve an accurate maturity assessment of a digital business ecosystem from your point of view?               |
|                             |               | FB6       | Which dimensions are not helpful to assess the maturity of your digital business ecosystem?                                                    |
|                             | Effectiveness | FB7       | Does the maturity model application support increasing the degree of DBE maturity?                                                             |



## A.6 SLR Results

| Title                                                                                                                                                         | Ref.                         | Year | Scope                   | Analysis Dimensions                                                                             | Levels      | Definition                | Evaluation          | Application      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------|-------------------------|-------------------------------------------------------------------------------------------------|-------------|---------------------------|---------------------|------------------|
| Customer Relationship Management (CRM) Implementation Evaluation Using Maturity Assessment in Telecommunication Industry: Case Study of an Indonesian Company | [Saputra et al., 19]         | 2019 | Change Management       | Market-Access, Culture, Governance, Strategy                                                    | five-level  | literature                | single case study   | interviews       |
| Development of a Digital Transformation Maturity Model for IT Companies                                                                                       | [Gollhardt et al., 20]       | 2020 | Digital Transformations | Technology, Culture, Governance, Strategy                                                       | five-level  | interviews and literature | feature comparison  | interviews       |
| Logistics 4.0 Maturity in Service Industry: Empirical Research Results                                                                                        | [Werner and Kosacka, 19]     | 2019 | Industry 4.0            | Monolithic Dimension                                                                            | five-level  | interviews and literature | single case study   | survey           |
| An Industry 4.0 maturity model for machine tool companies                                                                                                     | [Rafael et al., 20]          | 2020 | Industry 4.0            | Technology, Culture, Governance, Strategy                                                       | five-level  | literature                | single case study   | interviews       |
| A focus area maturity model for software ecosystem governance                                                                                                 | [Jansen, 20]                 | 2020 | Software Ecosystems     | Knowledge Management, Innovation, Technology, Market-Access, Culture, Governance                | eight-level | interviews and literature | multiple case study | interviews       |
| Towards a Systemic Maturity Model for Public Software Ecosystems                                                                                              | [Alves et al., 11]           | 2011 | Software Ecosystems     | Monolithic Dimension                                                                            | five-level  | literature                | single case study   | survey           |
| A maturity model for software startup ecosystems                                                                                                              | [Cukier and Kon, 18]         | 2018 | Software Ecosystems     | Knowledge Management, Innovation, Technology, Market-Access, Culture, Governance, Expandability | three-level | interviews                | multiple case study | interviews       |
| A Maturity Model for Assessing the Digital Readiness of Manufacturing Companies                                                                               | [De Carolis et al., 17]      | 2017 | Industry 4.0            | Technology, Process, Governance                                                                 | five-level  | literature                | single case study   | survey           |
| Developing a Maturity Model for Digital Servitization in Manufacturing Firms                                                                                  | [Adrodegari and Saccani, 20] | 2020 | Industry 4.0            | Process, Culture, Governance, Strategy                                                          | three-level | interviews and literature | multiple case study | interviews       |
| Startup Ecosystem Maturity and Visualization: The Cases of New York                                                                                           | [Cukier et al., 20]          | 2020 | Change Management       | Innovation, Culture, Governance                                                                 | four-level  | interviews and literature | multiple case study | interviews       |
| Towards a Maturity Model for Digital Strategy Assessment                                                                                                      | [Mohamed, 20]                | 2020 | Digital Transformations | Innovation, Technology, Culture, Governance, Strategy                                           | three-level | literature                | no evaluation       | software program |
| Towards a capability and maturity model for Collaborative Software-as-a-Service                                                                               | [Cancian et al., 20]         | 2020 | Software Ecosystems     | Innovation, Technology, Process, Market-Access, Governance, Strategy                            | five-level  | interviews and literature | single case study   | interviews       |
| A practice-based maturity model for holistic TTO performance management: development and initial use                                                          | [Kreiling and Bounfour, 19]  | 2019 | Change Management       | Knowledge Management, Innovation, Culture, Expandability                                        | five-level  | literature                | multiple case study | survey           |
| Development of maturity model for assessing the implementation of Industry 4.0: learning from theory and practice                                             | [Wagire et al., 20]          | 2020 | Industry 4.0            | Technology, Process, Culture, Governance, Strategy                                              | four-level  | interviews and literature | single case study   | survey           |
| To assess smart manufacturing readiness by maturity model: a case study on Taiwan enterprises                                                                 | [Lin et al., 20]             | 2020 | Industry 4.0            | Technology, Process, Governance                                                                 | five-level  | literature                | multiple case study | survey           |

|                                                                                                                 |                               |      |                         |                                                                 |            |                           |                     |                |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------|------|-------------------------|-----------------------------------------------------------------|------------|---------------------------|---------------------|----------------|
| How to assess the success of the open data ecosystem?                                                           | [Donker and van Loenen, 17]   | 2017 | Software Ecosystems     | Technology, Culture, Governance, Strategy                       | five-level | literature                | single case study   | interviews     |
| Design of an Assessment Industry 4.0 Maturity Model: an application to manufacturing company.                   | [Azevedo, 19]                 | 2019 | Industry 4.0            | Knowledge Management, Innovation, Process, Culture, Governance  | score 0-1  | literature                | single case study   | survey         |
| Exploring open innovation in the digital age: a maturity model and future research directions.                  | [Enkel et al., 20]            | 2020 | Digital Transformations | Technology, Process, Market-Access, Strategy, Expandability     | six-level  | literature                | no evaluation       | no application |
| Digital technology adoption in a bank Treasury and performing a Digital Maturity Assessment                     | [von Solms and Langerman, 21] | 2021 | Digital Transformations | Knowledge Management, Technology, Process, Governance           | five-level | literature                | no evaluation       | no application |
| Project-based maturity assessment model for smart transformation in Taiwanese enterprises                       | [Lin and Wang, 21]            | 2021 | Digital Transformations | Knowledge Management, Process, Governance                       | five-level | literature                | no evaluation       | survey         |
| Digital transformation capability maturity model enabling the assessment of industrial manufacturers            | [Gökalp and Martinez, 21a]    | 2021 | Digital Transformations | Knowledge Management, Technology, Process, Governance, Strategy | five-level | interviews and literature | multiple case study | interviews     |
| Digital transformation maturity assessment: development of the digital transformation capability maturity model | [Gökalp and Martinez, 21b]    | 2021 | Digital Transformations | Knowledge Management, Technology, Process, Governance, Strategy | five-level | interviews and literature | feature comparison  | interviews     |

## A.7 Interview Documents

### Preliminary information:

#### Research context

The increase of competition, not only between companies but also between supply chains and networks, forces companies to align Business and IT, also with stakeholders across companies' borders. With the introduction of new technologies such as the Internet of Things, companies are seeking new bundled or hybrid business models that combine services and products from different providers.

The concept of Digital Business Ecosystems (DBE) allows enterprises to shift their concentration to network co-creation and co-evolution of bundled services and products whereby every involved enterprise is self-organized in terms of their business processes and enterprise architecture. The success of companies such as Alibaba, Amazon, Uber, and Airbnb outlines the potential of DBEs.

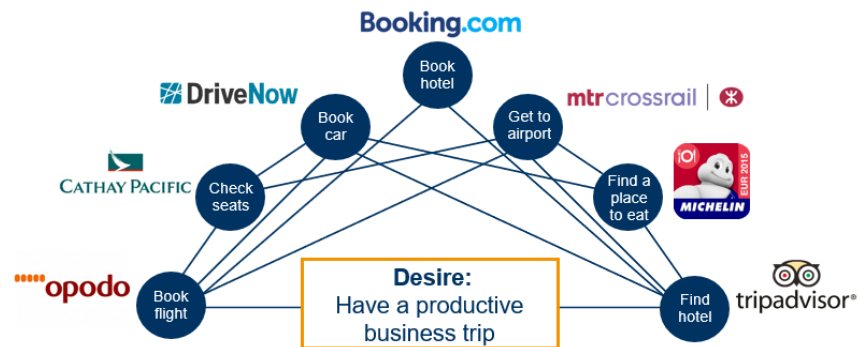


Figure 1: Schematic diagram of a Digital Business Ecosystem

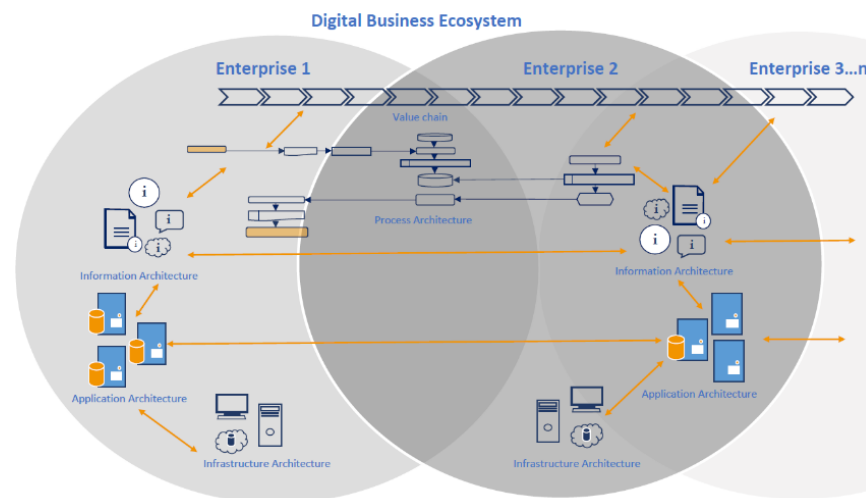


Figure 2: Architecture of a Digital Business Ecosystem

#### The intention of the interview

Currently, it is still unclear how DBEs start, grow, develop, die out, and renew again. Furthermore, it is questionable how to achieve mature management of Digital Business Ecosystems. This interview should highlight the practitioner's perspective on the maturity of existing DBEs. Therefore, we defined the following research questions:

RQ1: What is the nature of existing DBEs?

RQ2: How the different levels of maturity of existing DBEs can be defined and assessed?

RQ3: Which role play EAM in the value co-creation and co-evolution process within DBEs?

RQ4: How the management of DBEs can be improved?

Only the University of Innsbruck provides contributions to this project. No private or commercial use of the results is foreseen. The interview will evaluate all acquired information systematically and publish these within the scientific community.

Therefore, explicit consent is required. All personal details will be handled strictly confidential.

#### Interview protocol:

|                                          |                                  |                                  |                                  |
|------------------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Interview Protocol                       |                                  |                                  |                                  |
| Location                                 | Date                             | Time                             | Duration                         |
| Click or tap here to enter text.         | Click or tap to enter a date.    | Click or tap here to enter text. | Click or tap here to enter text. |
|                                          |                                  |                                  |                                  |
| Name of the participant:                 | Click or tap here to enter text. |                                  |                                  |
| Current job position:                    | Click or tap here to enter text. |                                  |                                  |
| Years of professional experience in EAM: | Click or tap here to enter text. |                                  |                                  |
| Industry Branch:                         | Click or tap here to enter text. |                                  |                                  |
| The number of employees:                 | Click or tap here to enter text. |                                  |                                  |
| How was the contact established?         | Click or tap here to enter text. |                                  |                                  |
|                                          |                                  |                                  |                                  |
| Contact details:                         |                                  |                                  |                                  |
| Click or tap here to enter text.         |                                  |                                  |                                  |
| Important hints:                         |                                  |                                  |                                  |
| Click or tap here to enter text.         |                                  |                                  |                                  |
| Confidentiality:                         |                                  |                                  |                                  |
| Click or tap here to enter text.         |                                  |                                  |                                  |

#### Research protocol:

##### Present Situation

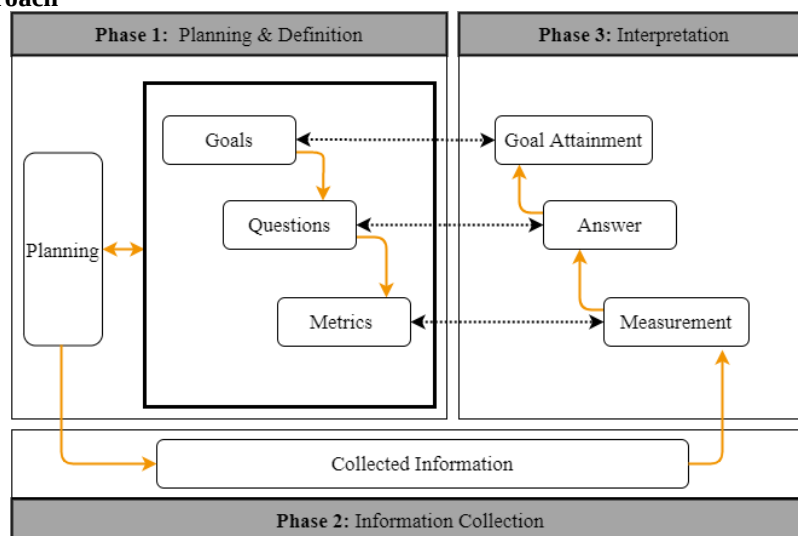
1. Can you describe the current status of the Digital Business Ecosystem (DBE) in your environment?  
Click or tap here to enter text.

2. Can you describe the co-evolution process of a DBE and the project portfolio planning among separated enterprises within a DBE?  
Click or tap here to enter text.
3. How are innovations in DBEs promoted and managed?  
Click or tap here to enter text.
4. Can you outline the advantages and expected benefits within this DBE?  
Click or tap here to enter text.

#### Maturity

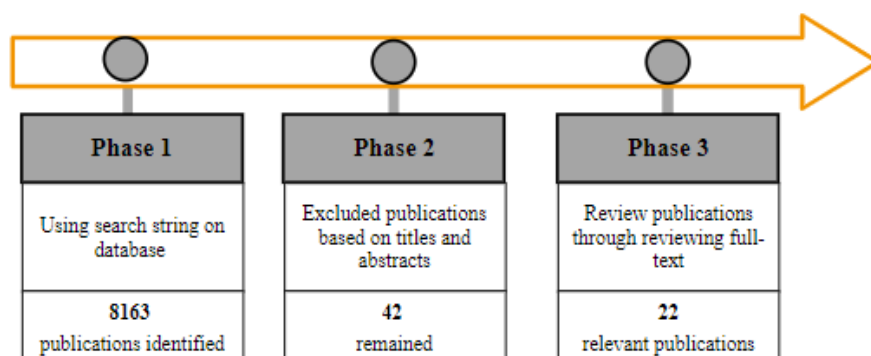
1. Which needs in the management of DBEs are not addressed? Can you also outline the challenges?  
Click or tap here to enter text.
2. How would you define different levels of maturity which you passed along the setup of the DBE? (e.g., level 1 integration of third-party services, level 2 offering internal services to other enterprises)  
Click or tap here to enter text.
3. Can you describe the impact of DBEs on the role of Enterprise Architects and Enterprise Architecture Management?  
Click or tap here to enter text.

#### A.8 GQM – Approach

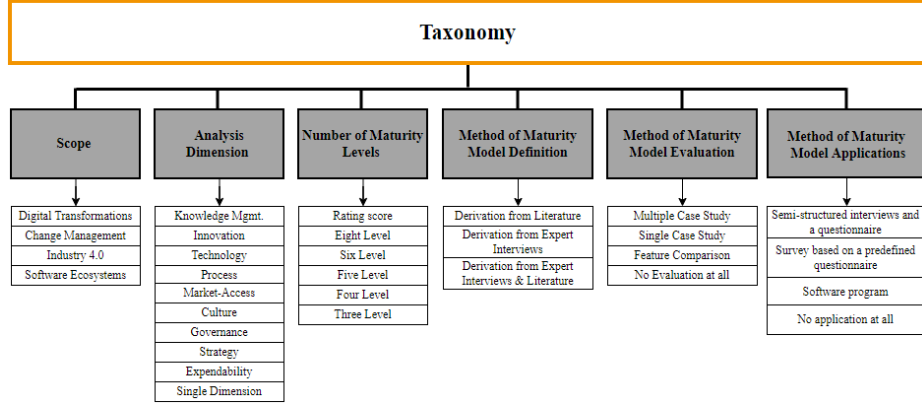


*GQM approach derived from [McGinn et al., 18]*

#### A.9 The SLR phases



#### A.10 Publication Classification Taxonomy



Publication Classification Taxonomy

#### A.11 Determinations of the goal, purpose, issues, objects, and viewpoints

|            |                                                                                                          |
|------------|----------------------------------------------------------------------------------------------------------|
| Goal       | Maturity                                                                                                 |
| Objects    | Digital Business Ecosystems                                                                              |
| Purpose    | Measure                                                                                                  |
| Issues     | Transparency, Standardization, Reusability, Knowledge base, Cybersecurity, Expandability, and Governance |
| Viewpoints | Business Architect, Information Systems Architect, Technology Architect, Other                           |

Determinations of the goal, purpose, issues, objects, and viewpoints

#### A.12 Results of the adapted classification taxonomy deployment

| Publications        | [Saputra et al., 19] | [Gollhardt et al., 20] | [Werner and Kowacka, 19] | [Rafael et al., 20] | [Jansen, 20] | [Alves et al., 11] | [Cukier and Kon, 18] | [De Carolis et al., 17] | [Adrodegari and Sacconi, 20] | [Cukier et al., 20] | [Mohamed, 20] | [Caucian et al., 20] | [Kreiling and Bounfour, 19] | [Wagire et al., 20] | [Lin et al., 20] | [Donker and van Loenen, 17] | [Azevedo, 19] | [Enkel et al., 20] | [von Solms and Langeman, 21] | [Lin and Wang, 21] | [Gokalp and Martinez, 21a] | [Gokalp and Martinez, 21b] | MM |
|---------------------|----------------------|------------------------|--------------------------|---------------------|--------------|--------------------|----------------------|-------------------------|------------------------------|---------------------|---------------|----------------------|-----------------------------|---------------------|------------------|-----------------------------|---------------|--------------------|------------------------------|--------------------|----------------------------|----------------------------|----|
| Analysis Dimensions | ●                    | ●                      | ○                        | ●                   | ●            | ○                  | ●                    | ○                       | ●                            | ○                   | ●             | ●                    | ○                           | ●                   | ○                | ●                           | ●             | ○                  | ●                            | ●                  | ○                          | ○                          | ●  |
| Definition Method   | ●                    | ●                      | ●                        | ○                   | ●            | ○                  | ○                    | ○                       | ●                            | ●                   | ○             | ●                    | ○                           | ●                   | ○                | ○                           | ○             | ○                  | ○                            | ○                  | ●                          | ●                          | ●  |
| Application Method  | ●                    | ●                      | ●                        | ●                   | ●            | ●                  | ●                    | ●                       | ●                            | ○                   | ○             | ○                    | ●                           | ●                   | ●                | ●                           | ○             | ○                  | ○                            | ○                  | ○                          | ○                          | ○  |
| Evaluation Method   | ●                    | ○                      | ○                        | ○                   | ●            | ○                  | ●                    | ○                       | ●                            | ●                   | ○             | ○                    | ○                           | ○                   | ○                | ○                           | ○             | ○                  | ○                            | ○                  | ○                          | ○                          | ○  |

Results of the adapted classification taxonomy deployment

#### A.13 Evaluation Summary

| Requirement                                   | Evaluation Measure                                                                            |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------|
| R1 - Comparison with existing maturity models | The comparison is made through the deployment of the classification taxonomy (section 4.5.2). |

|                                          |                                                                                                                                                                                                                                                                                   |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R2 – Iterative Procedure                 | The maturity model design was done in iterative cycles, starting with the SLR and the EI and followed by the online survey. We integrated the lessons learned from each step until an agreement was attained.                                                                     |
| R3 – Evaluation                          | The evaluation was done through its application (section 4.4), through participant feedback (section 4.5.1), and through deploying the classification taxonomy (section 4.5.2). The evaluation design followed the dimensions 1.) usefulness, 2.) quality, and 3.) effectiveness. |
| R4 – Multi-methodological Procedure      | We followed a multi-methodological procedure by combining an SLR with an EI and an online survey (sections 3.1, 3.2, 3.3).                                                                                                                                                        |
| R5 – Identification of Problem Relevance | The problem relevance was recognized through the SLR and confirmed by expert opinions within the EI (section 4.1.4).                                                                                                                                                              |
| R6 – Problem Definition                  | The problem was defined by outlining the research gap (section 4.1.4.2).                                                                                                                                                                                                          |
| R7 – Targeted Presentation of Results    | The result presentation will be done by offering the online survey to practitioners and publishing the article at hand.                                                                                                                                                           |
| R8 – Scientific Documentation            | The scientific documentation will be done through the publication of the article at hand.                                                                                                                                                                                         |

*Evaluation Summary, inspired by [Van Steenberg et al., 10]*

#### A.14 Scientific Databases

| Scientific Databases | Link                                                                                              | Retrieved Publications |
|----------------------|---------------------------------------------------------------------------------------------------|------------------------|
| ACM Digital Library  | <a href="http://dl.acm.org">http://dl.acm.org</a>                                                 | 3                      |
| AIS elibrary         | <a href="https://aisel.aisnet.org/">https://aisel.aisnet.org/</a>                                 | 769                    |
| CiteSeer             | <a href="http://citeseerx.ist.psu.edu">http://citeseerx.ist.psu.edu</a>                           | 4                      |
| IEEE Explore         | <a href="http://ieeexplore.ieee.org">http://ieeexplore.ieee.org</a>                               | 838                    |
| ScienceDirect        | <a href="https://www.sciencedirect.com/">https://www.sciencedirect.com/</a>                       | 1139                   |
| Scopus               | <a href="https://www.scopus.com/">https://www.scopus.com/</a>                                     | 28                     |
| Springer             | <a href="https://link.springer.com/advanced-search">https://link.springer.com/advanced-search</a> | 2322                   |
| Taylor and Francis   | <a href="https://www.tandfonline.com/">https://www.tandfonline.com/</a>                           | 1080                   |
| Wiley                | <a href="https://onlinelibrary.wiley.com/">https://onlinelibrary.wiley.com/</a>                   | 1986                   |

*Scientific Databases*

#### A.15 Inclusion and Exclusion Criteria

| Inclusion Criteria                                                   | Exclusion Criteria                                |
|----------------------------------------------------------------------|---------------------------------------------------|
| Accessible in full text                                              | Published before 2010                             |
| Article available in English or German                               | Duplicates                                        |
| Discussing maturity models in the context of digital transformations | Gray, white literature, and workshop publications |
| Introduce a maturity model for a dedicated purpose                   | General maturity discussions                      |

*Inclusion and Exclusion Criteria*

#### A.16 Quality Assessment Criteria

| ID | Question                                                         | Issue       |
|----|------------------------------------------------------------------|-------------|
| 1  | Is the paper based on research?                                  | Reporting   |
| 2  | Is there an adequate research context description?               | Reporting   |
| 3  | Was the research design appropriate to address the research aim? | Rigor       |
| 4  | Was the data analysis rigorous enough?                           | Rigor       |
| 5  | Is there a clear statement of findings?                          | Credibility |
| 6  | Is there a procedure conducted to ensure the paper's relevance?  | Relevance   |

#### A.17 Participant's Statements

| 4.1.1 General Conspectus of DBEs                  |                                                                            |
|---------------------------------------------------|----------------------------------------------------------------------------|
| Topic                                             | Participants                                                               |
| DBEs in governmental environments                 | (P4, P12, P16, P21, P23, P27)                                              |
| DBEs within a holding structure                   | (P3, P5, P6, P19, P20, P22, P28)                                           |
| DBEs among independent enterprises                | (P1, P2, P3, P7, P8, P9, P10, P11, P13, P14, P15, P17, P18, P24, P25, P26) |
| 4.1.2 Perceived Challenges                        |                                                                            |
| Topic                                             | Participants                                                               |
| Differing interests                               | (P5, P8, P9, P11, P12, P16, P22, P25, P26)                                 |
| Protecting an enterprise's intellectual property  | (P7, P11, P14, P15, P16, P21, P25)                                         |
| Strategy alignment                                | (P7, P10, P11, P17, P22, P24, P25)                                         |
| Segregated responsibilities                       | (P3, P4, P6, P17, P22, P25)                                                |
| Decision making                                   | (P4, P12, P22)                                                             |
| Vendor-lock-in effect                             | (P7, P10)                                                                  |
| Loss of control                                   | (P12, P13)                                                                 |
| Scope alignment concerning customer demand        | (P6)                                                                       |
| Limitation of entrepreneurial freedom within DBEs | (P12)                                                                      |
| Risk of making the wrong investments              | (P13, P25)                                                                 |
| More market competition                           | (P11, P13)                                                                 |
| Holistic view of the entire DBE                   | (P2, P3, P7, P10, P18)                                                     |
| Linked dependencies of systems and processes      | (P8, P10, P12)                                                             |
| Different timelines                               | (P6, P11, P13, P14)                                                        |
| Lack of aligned and used standards                | (P1, P3, P5, P20, P21, P27)                                                |
| Missing centralized IT                            | (P12, P13)                                                                 |
| Information security                              | (P2, P18, P19, P22, P25, P26, P27)                                         |
| Missing collaboration tools                       | (P11)                                                                      |
| Legacy system compatibility                       | (P11, P18, P20, P23, P24, P28)                                             |
| Lack of common understanding                      | (P5, P6, P12, P14, P17, P19, P21)                                          |
| Know-how                                          | (P1, P15, P26)                                                             |
| Complexity                                        | (P6, P8, P9, P19)                                                          |
| 4.2.1 Maturity Characteristics                    |                                                                            |
| Topic                                             | Participants                                                               |
| Expandability                                     | (P2, P3, P5, P7, P8, P11, P14, P16, P19, P21, P23, P25)                    |
| Joint governance                                  | (P5, P11, P12, P16, P19, P20, P21, P22, P24, P25, P26, P27)                |
| Extended security and data privacy                | (P2, P23, P24, P25, P27, P28)                                              |
| DBE knowledge base                                | (P2, P11, P16, P19, P21, P22)                                              |
| Reuse of existing services                        | (P2, P12, P13, P15, P16, P23, P24, P25)                                    |
| Standardization                                   | (P2, P5, P11, P13, P15, P20, P21, P25, P26, P27)                           |
| Transparency                                      | (P8, P11)                                                                  |

#### Participant's Statements

#### A.18 Design Science Research Steps

| Research Methods                                 | Design Science Methodology Steps        | Undertaken Activity                                                                                                                                                                                                                              |
|--------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expert Interview<br>Systematic Literature Review | Motivation and problem identification   | <ul style="list-style-type: none"> <li>Highlighting the motivation of forming a DBE by providing a general DBE conspectus</li> <li>Identifying the research problem through outlining perceived challenges and literature limitations</li> </ul> |
| Expert Interview<br>Systematic Literature Review | Definition of the solution requirements | <ul style="list-style-type: none"> <li>Gathering of knowledge concerning maturity characteristics, analysis dimensions, maturity levels, definition-, application-, and evaluation approaches</li> </ul>                                         |

|                                                  |                             |                                                                                                                                                                                                    |
|--------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                  |                             | <ul style="list-style-type: none"> <li>• Definition of the design objectives and the evaluation criteria</li> </ul>                                                                                |
| Expert Interview<br>Systematic Literature Review | Design of the artifact      | <ul style="list-style-type: none"> <li>• Specification of maturity dimension-like, level-like parts</li> <li>• Definition of the maturity model</li> </ul>                                         |
| Online Survey                                    | Application of the artifact | <ul style="list-style-type: none"> <li>• Definition of procedure and environment for the model application</li> <li>• Model application</li> </ul>                                                 |
| Online Survey<br>Systematic Literature Review    | Evaluation of the artifact  | <ul style="list-style-type: none"> <li>• Analysis of fit between model and its utility for problem-solving</li> <li>• Comparison of the model with requirements from related literature</li> </ul> |
|                                                  | Communication               | <ul style="list-style-type: none"> <li>• Publication</li> </ul>                                                                                                                                    |

*Design Science Research Steps*