The EE Domain

Authors: Marné de Vries
Aurona Gerber
Alta vd Merwe

Presented at: EEWC 2015
Clarion Hotel
Prague
17 June 2015

Introduction

- Enterprises originate when **man and machine** are **organised** to pursue some **common goal** [1].
- Researchers and practitioners from **different disciplines** study the enterprise as a phenomenon, and contribute from different perspectives to its evolution [1; 2].

Systems Engineering

Industrial Engineering

Information Systems

Management Sciences

Psychology

Sociology

Organisational sciences

Introduction

- Enterprise engineering (EE) emerged as a new **discipline** and could be defined as: “the body of knowledge, principles, and practices to **design an enterprise**” [1].
- In addition to enterprise design or engineering, Hoogervorst [5] adds a second theme: **enterprise governance** as the organisational competence for continuously **guiding enterprise evolution**.

Design & govern enterprise evolution

- According to Gregor, a key prerequisite for any discipline to progress is to **define its domain** by answering 3 questions [11]:
  1. What phenomena are of interest in the discipline 
  2. What are the core problems or topics of interest 
  3. What are the boundaries of the discipline 

Aim of the study

Validate the proposed domain of EE and **prioritise** the phenomena of interest and core problems/topics of interest.

Outline of this presentation

1. Provide **background** on:

   Enterprise Evolution Contextualisation Model (EECM), as a means to define the **domain of EE**, by answering the **3 domain questions** of Gregor.

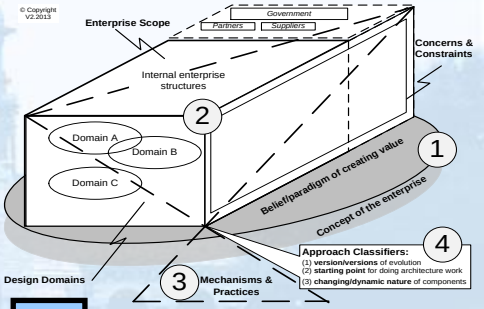
2. Present the **research method (questionnaire)** to **validate the domain of EE**.

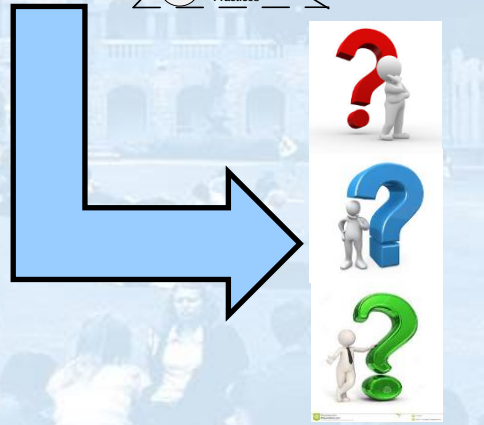
3. Discuss the **results of the questionnaire**.

4. Conclude with recommendations for **future research**.

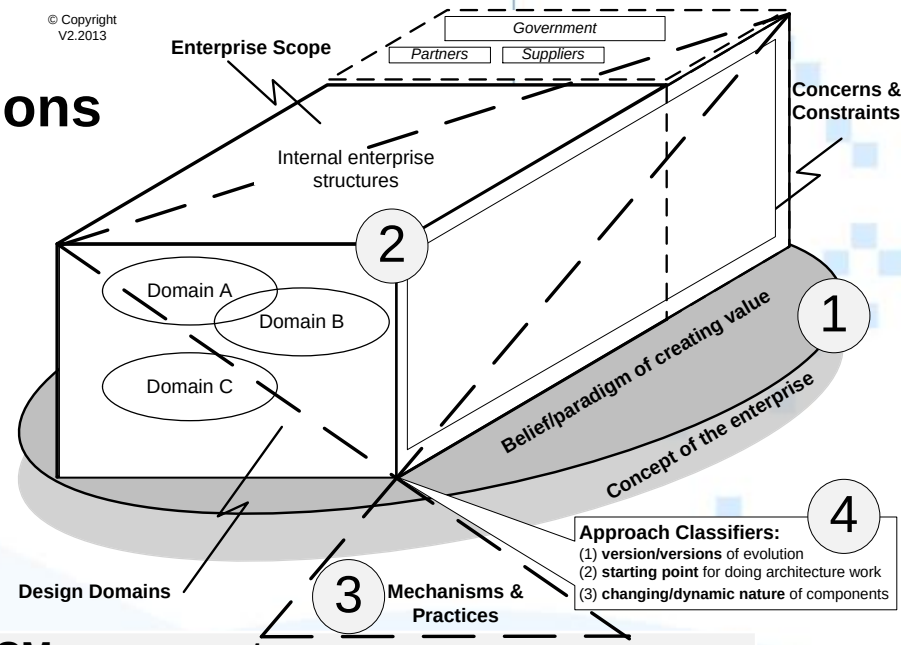
Previous research

- Previous research highlighted the **fragmentation that exists within the EE discipline** and the need to provide a **common reference model** to understand and compare existing knowledge within the EE discipline [12].
- EECM was developed inductively from an extensive analysis of **current prevalent EE approaches** and thus EECM presents a high-level categorisation and meta-model of the existing **EE body of knowledge** [9; 12; 13].
- It was proposed that the four components of EECM could be used to answer the three questions pertaining to the **domain of the EE discipline** [10].





EECM answering the domain questions

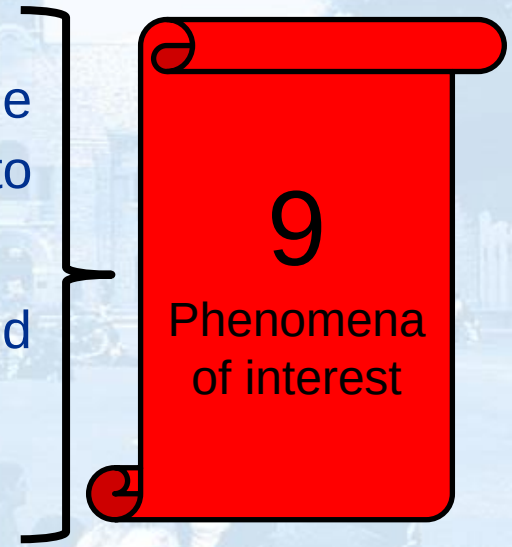


Domain questions	EECM components
What phenomena are of interest in the discipline?	Component 1: Concept of the enterprise & paradigm of creating value
What are the core problems or topics of interest?	Component 2: Dimensions Component 3: Mechanisms & practices Component 4: Approach classifiers
What are the boundaries of the discipline?	Component 1: creates a **philosophical boundary** Component 2: creates a **design scope boundary** Component 3: creates a **practical facet boundary** (different “ways of”) Component 4: creates an **approach pattern boundary** (different approach preferences)

Question 1: What are the phenomena of interest?

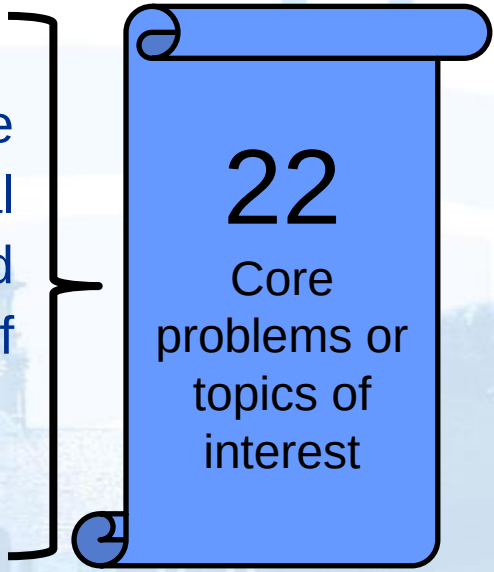
- During the development of EECM, there was evidence that EE researchers **addressed phenomena** related to the challenges of designing a **dynamic** socio-technical system.
- Multiple authors proposed design/ alignment/ governance **approaches** to address the **enterprise-related phenomena**.

- The first component encapsulates authors' value propositions (***paradigm of creating value***) to **address the observed phenomena**.
- From a **futuristic perspective**, we also included **phenomena that are currently emerging** [14].



Question 2: What are the core problems or topics of interest?

- When observed *phenomena* within any discipline are analysed, distinct **domain problems** are identified.
- The content of existing enterprise design/alignment/governance approaches reveal **several topics of interest**, which are represented in the second, third and fourth components of EECM [10].



Question 3: What are the boundaries of the discipline?

- The EE *phenomena of interest* and EE *problems/topics of interest* already demarcate the boundaries of the EE discipline.
- In terms of EECM the boundaries can also be defined as follows:
  - Component 1: creates a **philosophical** boundary
  - Component 2: creates a **design scope** boundary
  - Component 3: creates a **practical facet** boundary (different "ways of")
  - Component 4: creates an **approach pattern** boundary (different approach preferences)

4
Ways to demarcate boundaries

Research Method

- The **proposed domain of EE** had to be **validated** by **practitioners and researchers** that are active within the discipline.
- We used 3 opportunities to present the EE domain to EE researchers and practitioners:
  1. Enterprise Engineering Working Conference May 2014
  2. Enterprise Architecture Research Forum meeting June 2014
  3. Conference of the South African Institute of Industrial Engineering July 2014
- Distributed an electronic **questionnaire** to practitioners and researchers within the EE domain.
- 22 participants completed from 12 September - 1 October 2014.

Research Method

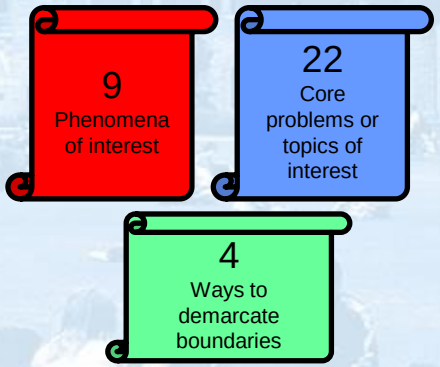
- Since respondents differ in training and experience within EE, the **respondent context** would influence opinions regarding **the domain of EE**. This research acknowledge the respondent context when interpreting the questionnaire results.

Respondent context
1. Academic background
2. Skill focus
3. Industry background

Opinions on the domain of EE
1. Phenomena of interest
2. Core problems or topics of interest
3. The boundaries of the EE discipline

Respondents had to rate the necessity/importance of pre-defined domain delimitation

+ add their phenomena and problems/topics of interest



Respondent context

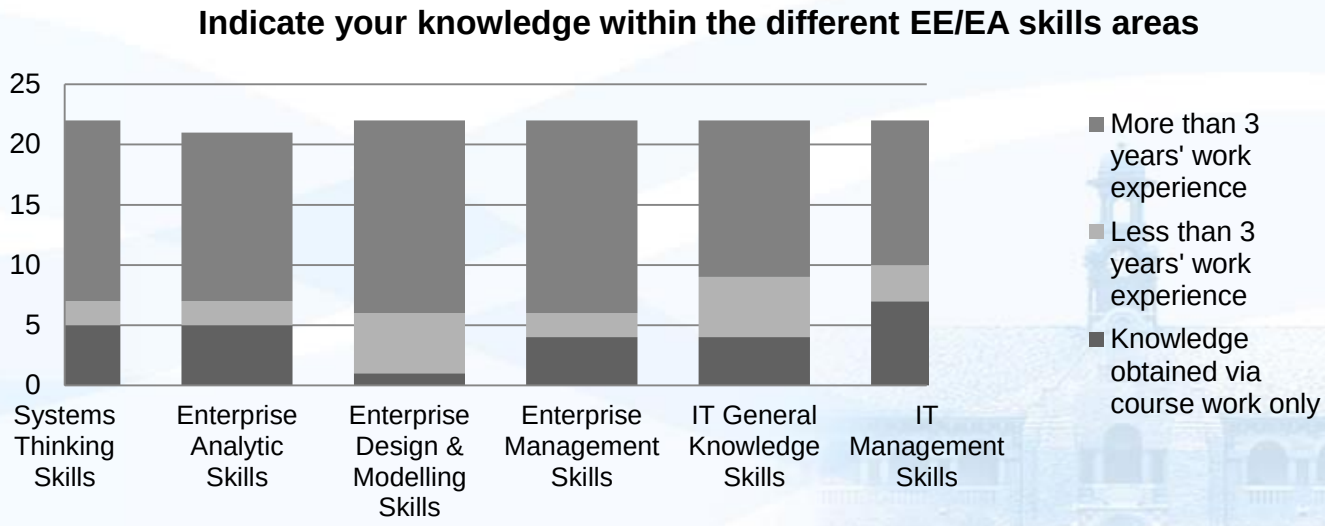
1. ***Academic background***
2. Skill focus
3. Industry background

- In terms of academic background, 15 out of 22 respondents (68%) obtained a research-related post-graduate qualification, i.e. 36% obtained a Masters, whereas 32% obtained a PhD.
- Respondents received qualifications from 13 different international universities.
- Respondents also had to indicate the topic of their dissertation/thesis. The topics could be associated with 4 of the 22 topics of interest, which could have influenced the prioritisation of EE problems/topics of interest.

Respondent context

1. Academic background
2. ***Skill focus***
3. Industry background

- Respondents indicated their skills for 6 Skills categories.



- **More than 50% of respondents** had significant work experience (Level 3).
- Skilled especially within the **enterprise design & modelling skills category**.

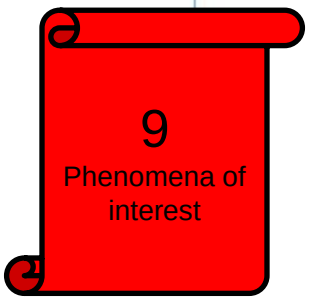
Respondent context

1. Academic background
2. Skill focus
3. ***Industry background***

- Industry experience within a wide range of industries (24 out of 27 industries).
- In terms of position, there is a balance between practitioners and academics:
  - 8 of 22 respondents (36%) are **practitioners**, with enterprise design/engineering-related positions.
  - 8 of 22 respondents (36%) are **academics**.
  - Other respondents (28%) are consultants / IT directors / managers.

Opinions on the domain of EE

1. ***Phenomena of interest***
2. Core problems or topics of interest
3. The boundaries of the EE discipline



- Respondents had to select 4 (out of 9) phenomena that they would rank as the most important to address within the EE domain.
- 50% or more (11 or more) of the 22 respondents prioritised 5 of 9 phenomena (1, 2, 3, 6 and 9).

Phenomena no. and description	Themes	Rating (number of responses)
1: The enterprise as a complex socio-technical system and its inability to adapt swiftly to rapidly-changing environments.	Enterprise complexity	1 (20)
2: The inability to view/understand the complex enterprise in a holistic way.	Enterprise complexity	2 (14)
3: The inability of enterprises to implement strategic initiatives successfully.	Enterprise complexity	3 (12)
6: Data ownership challenges when data sets are shared beyond the scope of the enterprise.	Data ownership	3 (12)
9: Society's concern with miss-management of natural resources and ill-treatment of low-income labour.	Societal and environmental concerns	4 (11)

Opinions on the domain of EE

1. Phenomena of interest
2. ***Core problems or topics of interest***
3. The boundaries of the EE discipline

22
Core problems or topics of interest

- Respondents had to select 10 (out of 22) problems/topics of interest that they would rank as the most important to address within the EE domain.
- 50% or more (11 or more) of the 22 respondents prioritised 8 of 22 topics (2, 5, 6, 8, 9, 11, 13, and 15).
- Topics 6, 8 and 13 corresponded with research topics of respondents.

Topic no. and description	Themes	Rating (number of responses)
2: Define or align concerns or interests that should be addressed by the entire enterprise and its demarcated design domains.	Alignment of concerns	4 (11)
5: Define the extent or scope of design/alignment/governance in terms of internal enterprise structures AND extended enterprise structures.	Scope of alignment	3 (13)
6: Architecture description, reference models and modelling practices for different enterprise design domains.	Modelling	2 (15)
8: Design methodologies for designing the entire enterprise.	Methodologies	1 (16)
9: Enterprise design methodologies that cover the entire enterprise life cycle.	Methodologies	4 (11)
11: Governing mechanisms, practices (practice frameworks) and standards.	Governance	3 (13)
13: Problem analyses practices and mechanisms to facilitate the identification of problems and the severity/effects of existing problems.	Problem analysis	3 (13)
15: Impact analyses during enterprise re-design to estimate the impact/feasibility of different alternative solutions in terms of cost, schedule or change impact.	Impact analysis	4 (11)

Opinions on the domain of EE

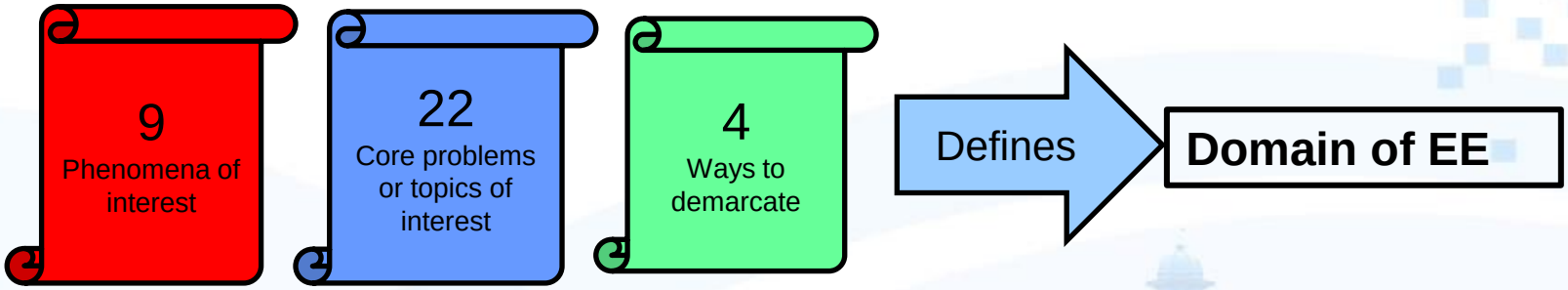
1. Phenomena of interest
2. Core problems or topics of interest
3. ***The boundaries of the EE discipline***

4
Ways to demarcate boundaries

- Respondents had to comment on the *ability or inability* of using 4 pre-defined boundaries to demarcate the boundaries of the EE discipline.
- The results indicated that:
  - 13 respondents fully agreed (36%) with the demarcation or partially agreed (23%) with the demarcation. The majority of these respondents (70%) indicated that the **philosophical boundary** (*Concept of the enterprise and paradigm of creating value*) enables EE boundary demarcation. Respondents that partially agreed argued for excluding the other 3 ways of boundary demarcation.
  - 7 respondents (32%) were unable to answer the question.
  - 2 respondents (9%) disagreed with the boundaries.

Discussion

- The results of the questionnaire indicated that:



- Thus there is strong evidence that EECM can be used as a representation of the **EE domain** within the emerging EE discipline.
- Prioritisation of *phenomena of interest* indicates that:
  - the **complexity of the enterprise** is the most prominent theme Other themes that are less prominent include data ownership and addressing societal and environmental concerns.
  - The phenomenon that was allocated the lowest priority was ‘customers demanding always-availability of the enterprise’.

Discussion

- Prioritisation of *problems or topics of interest* indicates that:
  - **Two highest** rates focused on 2 themes: **methodologies** and **modelling**.
    - A number of theoretical methodologies, frameworks and modelling languages already exist, but respondents indicated that more research is required.
    - Confirmed by some of the respondents, there is still a gap between what existing EE theory offers and its usefulness in practice.
  - **Third position** included 3 themes: (1) the **scope of alignment**, (2) **governance**, and (3) **problem analysis**.
  - **Fourth position** included 2 themes: **alignment of concerns** and **impact analysis**.
  - Futuristic topics incorporated from [14] were **not prioritised** by respondents.

22
Core problems or topics of interest

Discussion

- Additional *phenomena and problems or topics of interest* identified by respondents:
  - Differentiating between EA and EE.
  - Integrating insights from traditional organisational sciences within the design perspective of enterprise engineering.
  - The observation that ideas of EE are not disseminated effectively via the education system.
  - The observed chasm between what organisational sciences already know and what management does.
  - The use and impact of social media.
  - Incorporating potentially contributing/complementary and objective bodies of knowledge to improve the definition of the field, namely those from viable systems theory and value systems theory.

NOTE:

Most of these are not **domain-related** issues

But

Structural or ontological issues
+
socio-political issues

Conclusion & future research

- According to Gregor [11], four classes of questions need to be answered when establishing a new discipline:
  1. **Domain questions**, the focus of our article. **Additional topics will continue to emerge**.
  2. **Structural or ontological** questions. E.g. What is theory? How is this term understood in the discipline? Of what is theory composed? **EE theories already developed within this area**.
  3. **Epistemological** questions. E.g. How can scientific knowledge be acquired? How is theory tested? What research methods can be used? **Philosophical foundations of Jan Hoogervorst provides a good foundation.**
  4. **Socio-political** questions. E.g. Are scholars in the discipline in general agreement about current theories or do profound differences of opinion exist? How is knowledge applied? **Need to be answered**.

Conclusion & future research

- Our research validated the use of EECM as a representation of the **domain of EE**.
- The list of EE topics are useful to stimulate research within the discipline of EE.
- Yet, the *additional phenomena and problems or topics of interest* identified by respondents confirmed that answering the domain questions alone are insufficient to establish a discipline.
- Future research is suggested to apply all four classes of questions suggested by Gregor [11] in establishing EE as a discipline.

Contact Details

Dr Marne de Vries
Department of Industrial Engineering
University of Pretoria, South Africa
Marne.devries@up.ac.za

Dr Aurona Gerber
Department of Informatics & Meraka Institute CSIR
Aurona.gerber@up.ac.za

Prof Alta vd Merwe
Department of Informatics
University of Pretoria, South Africa
Alta.vdm@up.ac.za