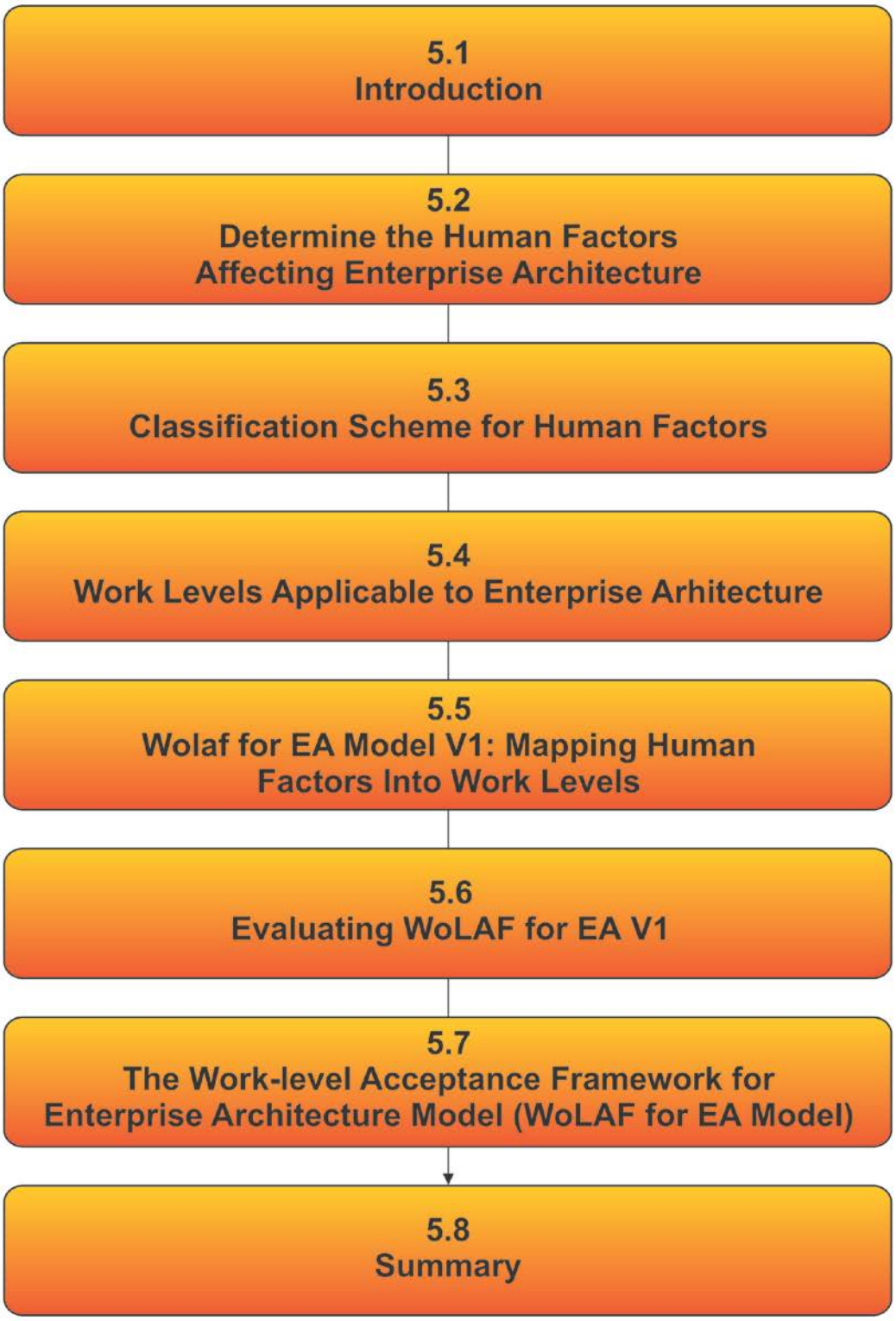
CHAPTER 5 - DEVELOPMENT OF THE WORK-LEVEL ACCEPTANCE FRAMEWORK FOR ENTERPRISE ARCHITECTURE MODEL



5.1 INTRODUCTION

The main research objective of the research was:

> *To develop a framework of human factors to assist organisations in managing the acceptance of enterprise architecture.*

In order to develop the framework of human factors, two research objectives and related sub-objectives were defined.

> RO1: *To design a model that will assist organisations in management of EA acceptance.*
>
> SO1.1: *To determine the human factors affecting EA acceptance.*
>
> SO1.2: *To determine the work levels applicable to EA.*
>
> SO1.3: *To categorise the human factors per work level into human concerns.*
>
> RO2: *To propose a method to use the model to assist organisations for management of EA acceptance.*

This chapter describes the research and data collection processes as it unfolded to address research objective 1 (RO1), namely to *design a model that will assist organisations in management of EA acceptance*.

Figure 5.1 presents a high-level illustration of the design research process followed to achieve the overall objective. This chapter refers to Development Phase 1 of the design science cycle and describes the development of the model for the management of EA acceptance.

RO1 involved three sub-objectives, addressed as follows in this chapter:

- SO1.1, *to determine the human factors affecting EA acceptance*: This involved three activities, as discussed in Section 5.2, namely:
  - An exploratory study conducted in one South African organisation making use of semi-structured interviews and a focus group interview to identify human factors that could possibly impact on EA acceptance.
  - A study of existing literature to identify additional human factors related to EA and technology acceptance
  - Integrating the sets of human factors from the exploratory study and the literature review into a coherent list of human factors and classifying them into a set of human concerns.

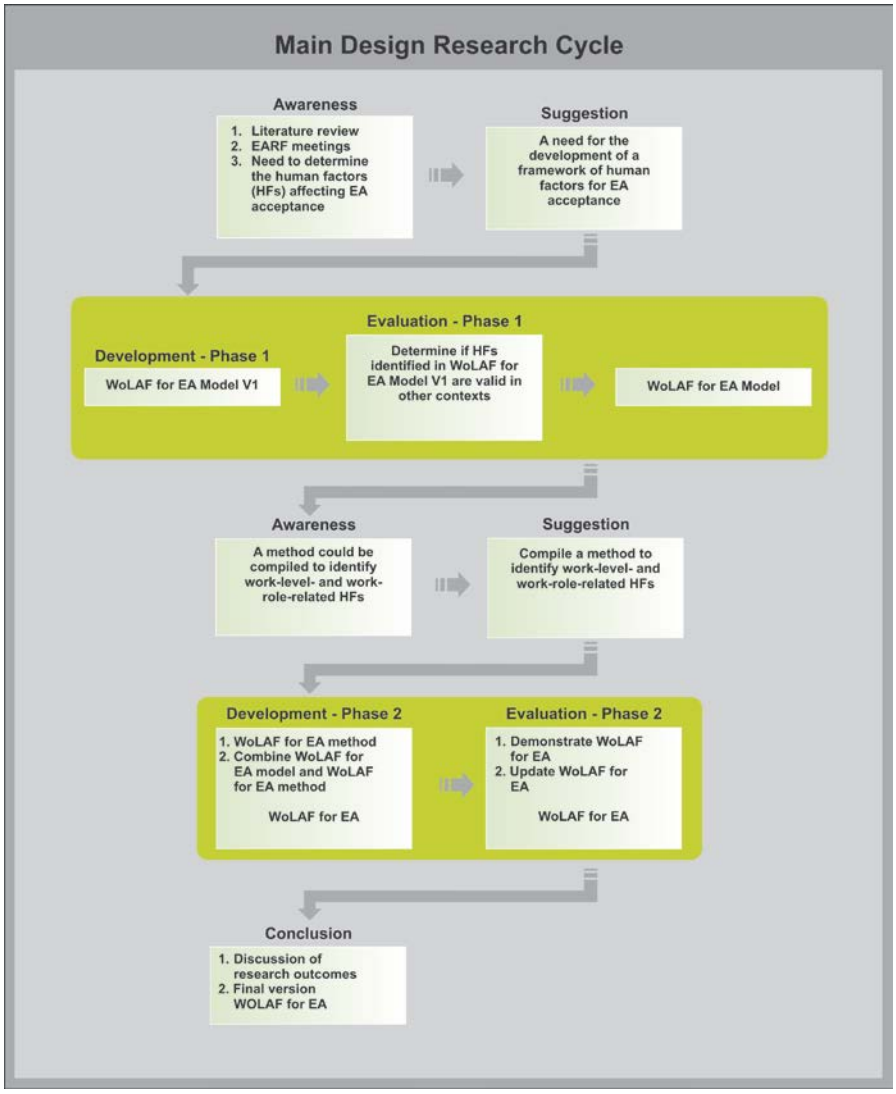


Figure 5.1: Main design research cycle

- SO1.2, to determine the work levels applicable to EA, as discussed in Section 5.3.
- SO1.3, to categorise the human factors per work level into enterprise architecture human concerns, as discussed in Section 5.4.

The outcomes of these activities are used in Section 5.5 to compile a first version of the model component of the Work-level Acceptance Framework for Enterprise Architecture (WoLAF for EA V1).

WoLAF for EA Model V1 is evaluated in more contexts to determine the validity of the human factors and to confirm the work-level categorisation of human factors (Section 5.6).

In Section 5.7, the composition of WoLAF for EA Model is discussed and the model is presented.

The chapter concludes with a summary.

5.2 DETERMINE THE HUMAN FACTORS AFFECTING ENTERPRISE ARCHITECTURE

SO1.1, *to determine the human factors affecting EA acceptance,* involved three sub-cycles:

- Sub-cycle 1, an exploratory study conducted in one South African organisation, making use of semi-structured interviews and a focus group interview, to identify human factors that could possibly impact on EA acceptance, as discussed in Section 5.2.1.
- Sub-cycle 2(1), a study of existing literature to identify additional human factors related to EA and technology acceptance, as discussed in Section 5.2.2
- Sub-cycle 2(2), integrating the sets of human factors from the exploratory study and the literature review into a coherent list of human factors, as discussed in Section 5.2.3.
- Sub-cycle 3, classifying the list of human factors into a set of human concerns, as discussed in Section 5.3.

5.2.1 Exploratory Study

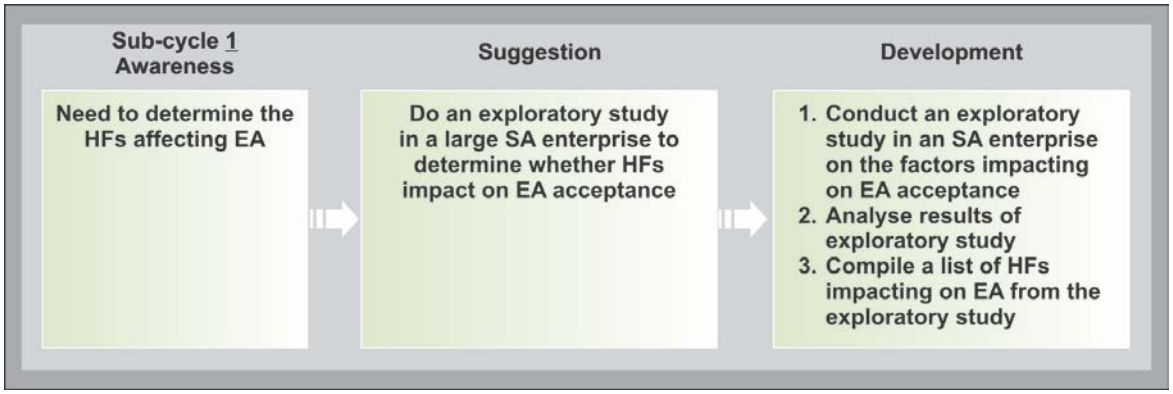


Figure 5.2: Design research Sub-cycle 1

Design research Sub-cycle 1 involved an *exploratory study to identify the human factors affecting EA acceptance in a large and complex South African organisation,* and consisted of three typical design research phases: awareness, suggestion and development. As discussed previously, in an initial awareness phase the need to determine human factors affecting EA acceptance was identified. A single exploratory study was suggested as a data collection method to explore the question: *What are the human factors affecting EA acceptance in a large and complex South African organisation?* The aim of the exploratory study was therefore twofold: first to investigate the organisational context in which EA was adopted; and, second, to identify the human factors that impacted on EA acceptance.

In sections 5.2.1.1 to 5.2.1.4 data collection as part of the exploratory study in the development phase of Sub-cycle 1 is discussed.

5.2.1.1 Background

The enterprise chosen for the exploratory study in the development phase of Sub-cycle 1 was a complex, manufacturing organisation based in South Africa but with global interests, organisations and offices spread country-wide and internationally. The enterprise was chosen because of its involvement in change management and acceptance of EA as a strategy, which included alignment of its business and IM strategy over the last decade. In South Africa, the enterprise is involved in extracting raw materials to assist in the production of a wide variety of products used in everyday life. Although sophisticated and well researched technology is used in the production processes, this study is concerned with the socio-technical factors affecting alignment of "business" strategy and information management of the enterprise through use of technology. The exploratory study was perceived as an appreciative inquiry and data collection methods used were semi-structured interviews and a focus group (Section 4.6).

Five semi-structured interviews and a focus group (five participants) were conducted to gather qualitative data at three different sub-organisations forming part of this complex enterprise. One sub-organisation is perceived by employees as "centralised" and the two others as decentralised. In all interviews and the focus group discussion, participants gave background information of how business and IT-related processes were initialised and run in their perspective work divisions. Everybody elaborated on how and why changing to a "new direction" became inevitable.

5.2.1.2 Interviews

Appointments for interviews were initially made telephonically and confirmed via e-mail. The objective and aims of the research were described in a letter of informed consent and e-mailed to participants before the meetings. Permission was asked to record interviews.

During all interviews, the format of the meeting was as follows:

- The researcher introduced herself as a student and briefly explained the reason for the interview.
- The research statement was given and the context of the research concerning human acceptance of EA in organisations was stated. The purpose of data collection was explained in the context of a human-driven organisation where EA is concerned with the description of how business, IM and IT integrate, utilising The Zachman Framework for Enterprise Architecture's "Who", "When" and "Why" columns.
- It was explained to participants that the research aimed to compose a framework of human factors to assist in the management of EA acceptance.

The following questions were compiled prior to the semi-structured interviews to guide the conversation between the researcher and participants when needed:

- What is enterprise architecture? (clarifying conceptual understanding of terminology)
- Describe the EA environment-organisational profile, operating model, objectives and critical success factors of the organisation related to EA (gaining an understanding of the context of EA in the organisation).

- Who decided to adopt EA as an organisational strategy? When was EA adopted and why? (stakeholder involvement and decision making)
- What was the process followed? (project approach or other approaches)
- What frameworks and tools were used?
- Who are the important stakeholders in EA and what is the scope of their involvement?
- Have any human factors affecting EA acceptance been identified in the organisation?

The data collection focused on how people reacted to EAs having been adopted in the enterprise and the specific sub-organisations within the enterprise. More important for the research reported on in this thesis, though, were the reasons for people's actions. This correlated with the description of qualitative data collection and descriptive exploratory study data collection as described in Section 4.6.

The approach to the research was inductive and agreed with the following guidelines for inductive studies listed by Saunders *et al.* (2009:127):

- understanding of meanings humans attach to events;
- understanding the research context;
- collecting qualitative data;
- realising that the researcher is part of the research process; and
- accepting that the emphasis of the research may change as the research progresses.

The processes of purposive and snowball sampling was followed (Section 4.6.5). In an initial interview one manager concerned with change management was approached and interviewed. On referral of this first participant other people were contacted and asked to participate.

The four other participants in the exploratory study were selected randomly by recommendation and/or availability (Section 4.6.5). The participants included were selected on the basis of the criterion that they had been aware and involved in the business, IM and IT integration process of the organisation for the previous five years or longer. One project manager and engineer, one HR employee assigned to change management process, one business and EA consultant and one technician were interviewed.

Responses to questions are summarised in Table 5.1.

Table 5.1: Responses of participants

QUESTIONS	RESPONSES OF THE FIRST PARTICIPANT MANAGER	RESPONSES OF OTHER PARTICIPANTS
What is enterprise architecture?	• EA is the alignment of your resources with organisational business strategy • Value chain – from strategy to resources to processes • Use a simple definition that is not too theoretical and that everybody understands • Communicating the practical implication of EA is more important than a definition	• Change management is an organisational component or process used to align business and IM. IT is the enabler • It is the way in which the business of an organisation is supported by IM and IT • Concept of EA and the term "EA" not universally accepted

QUESTIONS	RESPONSES OF THE FIRST PARTICIPANT MANAGER	RESPONSES OF OTHER PARTICIPANTS
Describe the EA environment of your organisation?	• Organisation is 50 years old and has become very complex with different business units, each responsible for profit and loss • Complex operations management • Risk too big to re-engineer, rather change operations management • Structure, operations management and business principles are woven • Roles and work roles not necessarily profit driven	• A business development and control model is followed • Models are developed to align business, IM and IT • Different work roles have different views and tasks. Technicians have to follow management initiatives • Systems development follow a plan, build and run strategy usually executed within a project context
When was EA adopted and why was it adopted?	• Dealing with complexity was the driving factor • Initiative for EA adoption came from IM and IT • Acceptance happened bottom-up • IT is an enabler, process driven. • Optimisation of functions is in process	• Quest for EA or change often originates from IM and IT people. • Adoption and decision making happen at executive and management levels • Business consultants play a role in adoption
Explain the process that was followed?	• Stakeholders want to see and experience the added value of EA • Started with projects but at some point in time EA moves beyond project stage into master data organisation, process organisation, governance, ownership and formal change – low level to maturity • Methodology should comprise added value • Standard operating model is: "Decisions before action"	• Process is mapped out by project and process managers – IM and IT follow models and procedures • What is the process? Who is responsible? What are the deliverables? When is the work due to be finished? Why is it done this way? • Processes are to be consolidated – IM to be centralised
Who are the stakeholders involved and what is the scope of their involvement?	• "A stakeholder is someone who can pull the plug on you" • Executive management – take notice General process controllers – manage Process enablers – work with day-to-day outcomes IM and IT – EA implementation processes Users – failures and successes Few external stakeholders	• Stakeholders at different levels of acceptance • Work role of managers implies that they are oriented towards change and new development. Organisation is at risk if they do not accept change • Knowledge sharing is a problem • Users and stakeholders do not always understand IT procedures and procurement • Multiple roles in organisation
Are you aware of human factors that impacted on EA acceptance in your organisation?	• Explain EA "practically" – stakeholders should understand motives and the essence of EA operation • Use simple business language • Through communication stakeholders should visualise the value of the EA operation • If challenged by stakeholders, respond in a practical way and show results • Share small victories regularly and show the road	• Culture of different organisations are different and can impact on enterprise-wide EA acceptance • People have different skills levels • People have different attitudes towards EA • People have different EA maturity levels • People have a resistance to change
What are the human factors important for	• EA team members should be able to conceptualise on where and how EA is needed in an organisation	

QUESTIONS	RESPONSES OF THE FIRST PARTICIPANT MANAGER	RESPONSES OF OTHER PARTICIPANTS
EA team members?	• Use organisational principles and language when EA is introduced • Be persuasive when EA is introduced • Implement EA practically to show its benefits • Think analytically to convey the ongoing, long-term EA message • Understand EA metamodels • Show passion for EA • Never hide behind governance , be part of the EA team	
What are the human factors important for EA stakeholders?	• Be open-minded about EA • Be prepared to listen to others involved in the EA effort • Be prepared to give EA a chance • Allow decisions to filter through • Trust in the people involved and the EA processes is important • Take responsibility for your EA tasks • Show accountability for EA tasks • Patience – EA is an ongoing event • Show perseverance for the long-term EA process	• EA acceptance • Stakeholders should be able to communicate about their EA tasks • Stakeholders should be able to share their EA knowledge • Coordinate EA tasks when needed • Motivation to cooperate in EA tasks

As mentioned above, it was necessary for the researcher to understand the research context and the meaning that participants attached to EA being adopted as an organisational strategy. The data collected from the interviews were analysed and assimilated or coded into human factors where possible. Participants' descriptions of organisational decisions and processes were also recorded so that human factors in context could be understood. Table 5.2 presents a list of questions that relate to EA, organisational context and EA events, with human factors extracted from responses of participants by means of meaningful segments or phrases relevant to my study (Section 4.7.1).

All participants agreed that although the quest for EA usually comes from IM/IT stakeholders, decisions for organisational change or expansion and therefore adoption of EA happens at executive/management level. The change manager and technician agreed that not only do EA and other stakeholders have different maturity levels, but also that organisational processes and human participants are often at different maturity levels and therefore EA needs to be introduced in a practical way where it is most needed. EA should be communicated using an easy-to-understand and commonly accepted organisational language.

Table 5.2: Human factors affecting EA acceptance extracted from interview responses

QUESTIONS	HUMAN FACTORS
What is enterprise architecture?	• EA terminology and EA definition not always acceptable and understood • Understanding business and IM alignment with IT as enabler (EA) • Communicate EA practically through successes
Describe the EA environment of your organisation.	• Understand that EA addresses complexity • Understand 'as-is and to-be' organisational business, IM and IT strategy • Understand and accept work role differences
When was EA adopted and why was it adopted?	• Quest for EA and EA initiative originate from IM/IT work levels • Adoption of EA happens at business and management level • Acceptance happens bottom-up from workers and technicians work levels
Explain the process that was followed.	• EA is driven by business and management work roles and decisions • Need for consolidation of IM processes • IT follow business models and processes mapped out in projects • What, who, when and why of processing need to be answered
Who are the stakeholders involved and what is the scope of their involvement?	• Managers accept change more readily as part of their job description • IM/IT stakeholders at different levels of acceptance • Communication across different work levels needed • Knowledge sharing is needed
Are you aware of human factors that impacted on EA acceptance in your organisation?	• Culture differences of different sub-organisations • Differences in skills levels of stakeholders • Attitude of stakeholders towards EA directives • Maturity levels of stakeholders and EA processes • Human resistance to change • Share positive and negative results • Continuous sharing of added value of EA • Use of common business language
What are the human factors important for EA team members?	• Use simple and commonly understood language • Be persuasive when EA is introduced • Conceptualise and share the "EA" idea • Implement EA directives practically • Think analytically to establish a long-term EA devotion • Understand EA metamodels • Show passion for EA directives • Never hide behind governance, be part of an EA team
What are the human factors important for EA stakeholders?	• Be open-minded about EA • Be prepared to listen to other stakeholders • Be prepared to give EA a chance • Allow decisions to filter through • Trust EA processes and trust other EA stakeholders • Be responsible and take responsibility for tasks related to EA • Show accountability for EA tasks • Patience – EA is an ongoing, long-term event • Show perseverance for the long-term EA process • Human acceptance of EA • Stakeholders should be able to communicate about their EA role and EA tasks • Share knowledge about EA tasks • Coordination of EA tasks • Motivation to cooperate in EA tasks

5.2.1.3 Focus group

It was also the intention of the researcher to interview people from different sub-organisations involved in EA to get a broader view of how EA was accepted. Interviews with individuals are time consuming and in this case it was difficult to organise individual meetings with participants spread out over a distance (Section 4.6.1). A focus group interview was organised to get a collective view as well as individual opinions (Section 4.6.2).

EA as a business and information management strategy had been introduced and adopted at one of several of the decentralised sub-organisations of the enterprise. This decentralised sub-organisation is mostly concerned with specific services and tasks within the wider spectrum of the enterprise and does not offer all the enterprise services to its users, clients and stakeholders. After an audit done on systems and processes more than ten years ago, the need for a new ERP system focusing on business processes and systems was identified. This was the start of EA being adopted and implemented at this sub-organisation. The original architecture team was named the "process team" and consisted of employees with an IT or technical background. The focus group interview comprised one team member representing the centralised organisation and four EA team members representing one decentralised sub-organisation.

The appointment for the focus group was made telephonically and confirmed via e-mail. The objective and aims of the research were described in a letter of informed consent and e-mailed to participants before the meetings. Permission was asked to record interviews.

During the focus group meeting:

- The researcher introduced herself as a student and briefly explained the reason for the interview.
- The research statement was given and the context of the research concerning human acceptance of EA in organisations was stated. The purpose of data collection was explained in the context of a human-driven organisation where EA is concerned with the description of how business, IM and IT integrate, utilising The Zachman Framework for Enterprise Architecture's "Who", "When" and "Why" columns.
- It was explained to participants that the research aimed to compose a framework of human factors to assist in the management of EA acceptance.

Focus group participants were asked to share general knowledge on their working environment. It was the aim of the researcher to set the focus on the positive course of events regarding when EA was introduced in the sub-organisation as an organisational strategy. The data collection technique of appreciative inquiry was used by the researcher and focus group participants were asked to elaborate on their experiences of human involvement when EA was introduced (Section 4.6.4). In a group conversation, participants shared their EA experiences.

From the start of EA implementation in this particular sub-organisation, all systems and processes were initialised and based on business requirements or user needs. Management approved, adopted EA as a new direction and strategy and allowed the process team and implementers to show how EA could be used to address business- and user needs. As a first step, the process team or enterprise architects focused their attention on addressing business needs, user needs and solving problems identified by users and stakeholders

as urgent and important. Although EA methodology was implemented and solutions were planned using EA modelling techniques, users and stakeholders were not burdened with technical concepts and terminology. Users, stakeholders and information management technicians were guided in a step-wise process over time to cooperate in new ways of information management and reporting. Management, stakeholders and users could see how problems were solved and experienced outcomes of well planned projects and processes. The enterprise architecture team, familiar with EA terminology and methodology, adopted an EA strategy and methodology and, in their business environment and context, followed the rules of planning, modelling, executing and recording all projects and processes in a systematic manner. According to the participants, acceptance and buy-in of EA as a methodology and process occurred as a result of efficient addressing of user needs and effective solving of problems over time.

Questions prepared for the focus group included the following:

- Explain EA team member roles and responsibilities.
- Who were the stakeholders in the EA initiative?
- Explain management's business objectives and aims and organisational EA fit.
- Explain the process of EA adoption and acceptance.
- Elaborate on successes – what worked well?
- Explain stakeholder expectations and involvement.
- What was the reaction of humans regarding when EA was introduced as an organisational strategy?

Responses of the focus group participants following on the narrative and questions are listed in Table 5.3.

Table 5.3 Responses of focus group participants

QUESTIONS	RESPONSES OF PARTICIPANTS
Explain EA team member roles and responsibilities	• The enterprise architecture team, familiar with EA terminology and methodology, adopted an EA strategy and methodology and, in their business environment and context, followed the rules of planning, modelling, executing and recording all projects and processes in a systematic manner
Who were the stakeholders in the EA initiative?	• Management, EA team members, technology experts and users
Explain management's business objectives and aims, and organisational EA fit	• Management, stakeholders and users could see how problems were solved and experienced outcomes of well planned projects and processes
Explain the process of EA adoption and acceptance	• Management approved, adopted EA as a new direction and strategy and allowed the process team and implementers to show how EA could be used to address business- and user needs • The concept of EA and associated EA terminology were introduced to users and stakeholders in a step-wise way and in simple, understandable and communicable format
Elaborate on successes – what worked well?	• The process team or enterprise architects focused their attention on addressing business needs, user needs and solving problems identified by users and stakeholders as urgent and important • Although EA methodology was implemented and solutions were planned using EA modelling techniques, users and stakeholders were not burdened with technical concepts and terminology

QUESTIONS	RESPONSES OF PARTICIPANTS
Explain stakeholder expectations and involvement	• All systems and processes were initialised and based on business requirements or user needs • Users, stakeholders and information management technicians were guided in a step-wise process over time to cooperate in new ways of information management and reporting.
What was the reaction of humans regarding when EA was introduced as an organisational strategy?	• Acceptance and buy-in of EA as a methodology and process occurred as a result of efficient addressing of user needs and effective solving of problems over time

The EA implementation process was successful in one instance of the broad enterprise and acceptance of EA happened as a result of initial adoption and acceptance by management, efficient and visible service delivery and user- and stakeholder satisfaction. The EA concept and EA terminology were introduced to users and stakeholders step-wise and by means of generally used and understandable organisational language.

EA implementation threats and human factors identified by participants as hindering EA acceptance in the enterprise sense were:

- management should take ownership of EA;
- culture of sub-organisations differs;
- "mind change" is required;
- management awareness of EA long-term vision versus short-term problem-solving focus;
- accepting of responsibility is work-role related;
- understanding the concept of EA and its confusion with IT architecture;
- establishing of work-role responsibility and EA involvement;
- identify stakeholders' needs and requirements;
- start with EA where mostly needed and introduce step-by-step;
- cooperation of stakeholders and other people;
- coordination of people and processes;
- understanding organisational complexity;
- communication; and
- maturity levels of organisational sections and stakeholders.

Table 5.4: Human factors impacting on EA acceptance extracted from focus group responses

QUESTIONS	HUMAN FACTORS EXTRACTED FROM RESPONSES OF FOCUS GROUP PARTICIPANTS
Explain EA team member roles and responsibilities	• Understand business, IM and IT alignment • Understand and implement EA metamodels • Think analytically about EA in the long-term but implement EA practically • Communicate EA successes to management and users • Facilitate EA projects and processes

QUESTIONS	HUMAN FACTORS EXTRACTED FROM RESPONSES OF FOCUS GROUP PARTICIPANTS
	• Provide for differences in human and EA process maturity levels
Who were the stakeholders in the EA initiative?	• Management, EA team members, technology experts and users • Stakeholders should accept responsibility for EA
Explain management's business objectives and aims, and organisational EA fit	• Management, stakeholders and users could see how problems were solved and experienced outcomes of well planned projects and processes • Management should take ownership of EA • Management should be aware of the EA long-term vision versus short-term problem-solving focus • Communication of business objectives by management is important
Explain the process of EA adoption and acceptance	• Management approved, adopted EA as a new direction and strategy and allowed the process team and implementers to show how EA could be used to address business- and user needs • The need for EA was realised and communicated to management by the IT stakeholders • The concept of EA was introduced to users and stakeholders in a step-wise way • EA terminology was communicated to users in simple, understandable format • User and stakeholder needs were addressed • EA successes were communicated and shared among stakeholders and users • Culture of sub-organisations differs • Coordination of humans and EA processes
Elaborate on successes – what worked well?	• The process team or enterprise architects focused their attention on addressing business needs, user needs and solving problems identified by users and stakeholders as urgent and important • Although EA methodology was implemented and solutions were planned using EA modelling techniques, users and stakeholders were not burdened with technical concepts and terminology
Explain stakeholder expectations and involvement	• All systems and processes were initialised and based on business requirements or user needs • Users, stakeholders and information management technicians were guided in a step-wise process over time to cooperate in new ways of information management and reporting • Introduce EA where most needed or to address user needs and business requirements • "Mind change" is required by humans in an organisation • Human cooperation is needed in EA initiatives • Human understanding of organisational complexity • Communicate expectations • Allow EA communication and EA decisions to filter through
What was the reaction of humans regarding when EA was introduced as an organisational strategy?	• Acceptance and buy-in of EA as a methodology and process occurred as a result of efficient addressing of user needs and effective solving of problems over time • Understanding the concept of EA and its confusion with IT architecture • Work-role responsibility and its relation to EA tasks should be clear

Traditionally, IT system development and maintenance were conceptualised as separate from business issues. IT specialists were consulted when business and information problems called for a technology

solution. Vendors provided technology solutions or IT systems were designed and built by local technical teams (Figure 1.1). Today technology is regarded as an integrated core and basis for the business of any of the sub-organisations. The message is that the broad, complex enterprise cannot function successfully without good integration and alignment of business vision, IM and technology support – all of it human-driven (Figure 1.2). Some stakeholders – for example, technology professionals – have not as yet adjusted to this change in viewpoint.

5.2.1.4 Integrated Findings from Exploratory Study

Narratives and answers of interviewed participants were recorded and transcribed. These texts and my own notes were analysed and a list of human factors impacting on EA acceptance was compiled. Responses were analysed and segments identified to locate patterns (Section 4.7.1). A few examples of human factors identified from responses are highlighted and listed below (for the comprehensive list of responses, see Appendix A):

- *Managers* of sub-organisations, sections, sub-sections and departments within the scope of an enterprise *have to accept ownership and responsibility* for architectural business and information management alignment or EA.
- Enterprises and all its sub-organisations and sections are human-driven. *Human acceptance* of new directions and technology innovation are *prerequisites for business and IT alignment.* Acceptance sometimes calls for a "mind change".
- Culture and organisational politics influence acceptance of new directions in organisations.
- Implementation of *EA is a long-term, on-going and engineering process*. *Commitments* often need adjustment and reformation. New ideas need reification. Stakeholder understanding of the long-term vision of EA is needed.
- Good and frequent *communication* is not negotiable.
- Start the EA process where the *need for business and IT alignment* is high. Address stakeholders' needs. *Long-term vision* is impaired by urgent problems.
- Every project or process needs consistent and thorough planning. Use the 'as-is' and 'to-be' approach to explain the need for EA. Start with what the situation is and why it needs improvement or change. Then describe what the outcome needs to be. The roadmap of how to get the required results is the last step. A systematic approach, the business development & implementation model (BD & I) was adopted to align leadership, business, operational and technical efforts (Coetzee, 2007). This process is still followed to *convince humans to follow the correct procedures*.
- The *benefit of EA* in an organisation should be *visible to stakeholders* from the instantiation of and throughout the EA process.
- *Adoption* and implementation of EA as a strategy should be a *top-down process* (Figure 6.6). Starting with implementation of technology systems (bottom-up) is turning the clock back. Enterprises have become too complex. Stakeholders need to make "mind changes", understand and accept that complexity needs to be addressed in the long-term.

- Enterprise architects should be involved throughout the EA implementation process to set and maintain the focus, guide the process and check validity.
- *Enterprises* are heterogeneous and *complex* systems that are *human driven*.
- In most cases the need for *EA* is *driven from information technology and engineering levels*. Architects and systems analysts understand connections between business principles and technology and change-management leaders are responsible for communicating "new" directions to stakeholders. EA is a long-term- and initial costly investment. Therefore, adoption of EA happens at managerial and executive levels of sub-organisations within enterprises.

The following summary represents some of the most important findings about human factors affecting EA acceptance from the exploratory study:

- Participants were convinced that business leaders should take responsibility for an EA initiative to be successful.
- Participants agreed that the concept of EA needs to be communicated using an easy-to-understand and commonly used organisational language.
- Participants stated that the long-term vision of EA is difficult to communicate and maintain when short-term problems occur. EA should address urgent needs and problems but the long-term vision should be kept alive.
- Participants had experienced that successful outcomes of problem situations urged stakeholders and other people to accept EA.

Descriptions of experiences of participants during the interviews and focus group discussion in the exploratory study were analysed making use of inductive analysis (section 4.7.1). Human factors were identified and combined into one list of human factors impacting on EA acceptance, as presented in Table 5.5.

Table 5.5: Combined list of human factors

COMBINED LIST OF HUMAN FACTORS
• Management should accept responsibility and take ownership of EA • Management should facilitate and manage the transformation and cultural change after EA has been introduced as an organisational strategy • All stakeholders should understand EA language and concept • Involve stakeholders in EA initiatives, address stakeholder and user needs and share EA motives and small EA victories • Use a simple and commonly understood business and EA language • Communication – communicate EA across work levels, communicate EA practically, share positive and negative results, allow decisions to filter through, continuous sharing of the perceived and real value and benefits of EA • Understand the integration of business, IM and IT processes supported by EA from a human inclusive viewpoint • Support for EA should be organisation-wide • Understand and share the long-term vision associated with EA initiatives • Early identification of possible human related risks and human acceptance of the value of EA as a support strategy for risk management • Acknowledge human input and effort related to EA projects and processes • Personal, group and organisational dynamics are needed in EA initiatives • Management, stakeholders and users need to be involved in EA initiatives and processes • Management and EA stakeholders should share and understand the 'as-is' and 'to-be' roadmap of the organisation

- Management, stakeholders and users should have realistic EA expectations
- Human understanding of organisational business, IM and IT alignment is needed
- All stakeholders and users should agree on and follow standardised EA procedures
- Management and enterprise architecture team members should acknowledge human and EA maturity differences
- Demonstrate patience for the long-term and ongoing process of EA
- Show perseverance when organisational change happens and accept that it is a continuous process
- Open-mindedness is needed by all EA stakeholders and users for cooperation and coordination across work levels
- Knowledge and skills sharing should happen at all work levels
- EA stakeholder integrity, honesty and ethical behaviour promote cooperation in EA initiatives
- Professionalism of stakeholders is needed in handling of organisational business, IM and IT processes
- For EA to be successful, understanding of user and stakeholder needs and concerns are a starting point
- Mediator skills is an important human factor for management and architects
- To coordinate diversity and change, management and EA stakeholders should be capable of addressing local and global organisational issues
- EA analytical- and long-term thoughts have to be implemented practically in the short term
- Human understanding of EA metamodels is needed at various work levels
- Humans need dedication and passion to comply with the 'EA-way' of work
- Human interaction is needed in EA initiatives across all different work levels
- Humans involved in EA initiatives should be prepared to accept the EA challenge
- EA team members should provide EA guidance and not only concentrate on EA governance
- EA engagement is needed by management, all stakeholders and users
- Stakeholders and users should be able to identify reusable information
- Humans should be prepared to collaborate in EA initiatives across work levels
- When needed humans should be prepared to acquire teamwork skills
- Management and EA team members should use advisory skills
- All EA stakeholders and users should take responsibility for EA tasks related to their work roles
- Humans involved in EA initiatives should be accountable for EA tasks and processes
- Humans should provide feedback of EA tasks and report EA results
- EA stakeholders and users should adapt and adjust when needed in the course of EA related projects and processes
- Coordinate and enable information exchange and information preservation across work levels
- EA stakeholders should facilitate architectural modelling
- Human cooperation is needed in EA related tasks, projects and processes
- Humans should understand the balance between needs, quality of work and expenditure
- Accept responsibility to optimise and/or standardise EA processes when needed
- Stay focused in long-term EA initiatives
- Humans are responsible to retain and reuse information resources
- All EA stakeholders and users should understand the importance of their work roles in EA initiatives
- Human social networking for the benefit of the organisation should be understood by EA stakeholders and users
- Acknowledge and utilise cultural differences when called for in EA initiatives
- Humans should trust in self, co-workers and superiors
- Humans should accept organisational shared values and authority
- Humans should participate in the organisational EA venture
- Human organisational loyalty is needed for successful EA initiatives such as knowledge and information sharing and retention
- Human honesty is needed in EA work and EA inter-personal relations
- Stakeholders and users should be able to accept and provide EA and work-related training when needed to complete EA tasks, projects and processes

5.2.2 Determining Human Factors Applicable to EA from the Literature

Several human factors that affect EA acceptance have been identified during the exploratory study. There may be other human factors than those identified in the exploratory study that impact on EA acceptance. From the inception of the research, the realisation was that the literature on EA, organisations, and human acceptance models and theories had to be reviewed to identify human factors that could be applicable to

acceptance of EA. For the purpose of the research, it was also necessary to distinguish between the concepts of adoption and acceptance of EA, the reason being that these two concepts are often used interchangeably in the literature (Section 3.4.1).

The literature is used to identify human factors related to EA in Design research Sub-cycle 2(1) (Figure 5.3).

After human factors that affected EA acceptance had been identified in the exploratory study, three actions were planned to compile a more representative list of human factors that impact on EA acceptance:

1. Use the literature on EA adoption and acceptance, and EA frameworks to identify human factors related to EA acceptance (sections 2.5, 3.4.1 and 3.7).
2. Investigate applicable technology-acceptance models and other models and theories to identify human factors related to EA acceptance from these models and theories (sections 3.4, 3.5 and 3.6).
3. Construct a combined list of human factors identified from the exploratory study and the literature.

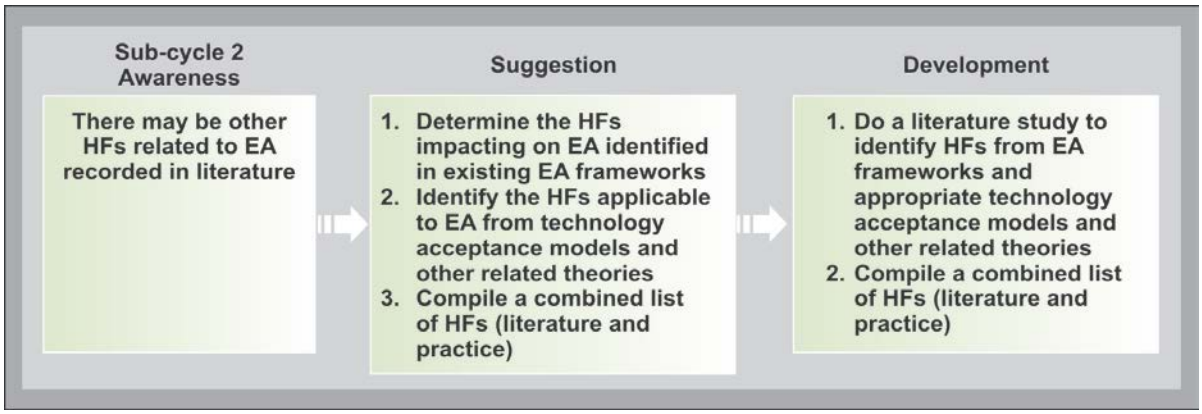


Figure 5.3: Design research Sub-cycle 2

Dietz (2010:1) and Hoogervorst (2009:428) distinguish between "functional" and "constructional" enterprise design areas and confirm that people (customers, suppliers, partners, stakeholders), products and the relationships between them are "functional" enterprise elements. Everything concerned with the internal organisational construction of employees, processes, practices, information management and IT support, forms part of the "construction" of an enterprise. As explained in Section 3.3 organisations depend on the performance of people. It was against the background of the functional role people play in enterprise operations that this study focused on identifying human factors impacting on EA acceptance and composed a framework of relevant human factors that can assist enterprises in the promotion and the management of EA acceptance.

The relationship between technology acceptance and EA is discussed in Section 5.2.2.1.

In Section 5.2.2.2 human factors related to EA adoption are identified and described. This is followed by a discussion of human factors related to EA acceptance in Section 5.2.2.3. A combined list of human factors related to EA is provided in Section 5.2.2.4.

Section 5.2.2.5 is used to discuss the definition of human role in EA frameworks and to identify human factors from three EA frameworks used as reference frameworks in the research.

In Section 5.2.2.6, human factors identified from the literature on technology acceptance and other theories related to EA are discussed.

5.2.2.1 Technology Acceptance Relating to Enterprise Architecture

Although Giddens's structuration theory (1984:16) was compiled in the context of societal institutions as structures and the role of technology was not explicitly described, the aspects of Giddens's structuration theory that affects research in IS have been described by Jones and Karsten (2008:135). An organisational structure depends on the operations of its members When structuration theory principles for research in IS as listed by Jones and Karsten (2008:135) are applied to EA research in the structure of an organisation, the following features need to be considered (Section 3.5):

- Stakeholders at all work levels apply their knowledge in practising their vocations in organisations. Information about stakeholders, their EA roles and their ways-of-work supply a researcher with knowledge about the organisational structure (Vernadat, 1996:287). If EA is accepted, the organisation has the advantage to gather knowledge about how humans involved in EA operate. Capturing and retaining useful human knowledge may result in reusable information.
- Human action and interaction are not controllable and contribute to organisational complexity. Management might initiate change but management of human factors, which may be the cause of resistance and anxiety when change happens in organisations, can be minimised if EA is accepted and maintained (Ross *et al.*, 2006:200).
- Context (organisational, environmental and social) will always have a direct influence on EA acceptance and implementation (Hoogervorst, 2009:107).
- There is a definite link between social structure in context and roles of humans/stakeholders (Hoogervorst, 2009:112; Lankhorst M. *et al.*, 2009:92).
- When the subject of research is the human/social element in organisations, material, sanction and structural issues may be perceived as "enabling" or "restrictive" (Jones *et al.*, 2008:132).
- Every enterprise has a different character defined, for example, by social structure, norms, power relations, mission and vision to name but a few (Kappelman, 2010:111).
- Human action and interaction in organisations are dynamic issues. Enterprises can benefit from research on management of social issues to promote synergy and creativity (Section 3.2).

Studies investigating and describing human acceptance of new technology were performed by Markus (1983:430), Magda (2009:11) and Sage (2006:109). Markus (1983:431) depicts interaction between humans and systems as a reason for resistance to accept new technology or strategies in organisations. Centralised data control in decentralised organisational structures and systems initiating power shifts are examples of how interaction can lead to resistance to technology and systems.

In a study by Magda (2009:11) human factors positively impacting on IT projects were identified as ensured *top-level support, communication, training and education* and *consideration and involvement of the target users*.

A model of factors contributing to success in business and IT alignment using EA was developed by Sage (2006:109). Factors relating to cognitive, social and behavioural alignment dimensions were considered. Cognitive factors included EA tools, EA plan, EA products, EA metrics, EA process and governance. Social factors contributing to success were *EA* control process of change management, governance, organisational sponsorship and participation and EA policy. The measure of maturity was identified as the only factor of *behavioural dimension*.

5.2.2.2 Human Factors Relating to Enterprise Architecture Adoption

Adoption of IT innovations classified into individual and organisational predictors as described by Jeyaraj *et al*. (2006:6) has been discussed in Section 3.6. The factors that impact on individual adoption of IT innovations are *perceived usefulness*, *top management support*, *computer experience*, *user support* and *behavioural intention*. Apart from computer experience which has not been identified as a human factors impacting on EA acceptance, all the other factors have been identified in the exploratory study of my research. For organisational adoption (EA adoption and acceptance have been distinguished in Section 3.4.1), factors identified are top management support, external pressure, professionalism of the IS unit and external information sources. Top management acts as a linking factor between individual and organisational adoption of IT innovations. In their study, Jeyarah *et al*. (2006:6) found that innovation and organisational characteristics were two common independent variables of individual and organisational adoption factors.(Adam, 2010:1)

The human factors important to my research and considered when human factors from Table 3.2 were analysed, are listed in Table 5.6. The area of applicability of human factors or human factors used in my research has been added in the third column of Table 5.6.

Table 5.6: Positive and negative influence of human factors (Kwon *et al.*, 1987:233-241)

INDIVIDUAL FACTORS AND ITS INFLUENCE IN ORGANISATIONS		HUMAN FACTOR APPLICABILITY AND USE IN THE RESEARCH
Job tenure	Functional and organisational knowledge result in acceptance whereas work role boundaries may contribute to resistance of new technologies	Work role distinction
Cosmopolitan	Wider than organisational perspective and contact with outsiders may result in acceptance of change	Enterprise/sub-organisation description and involvement in EA
Educational background	Education leads to acceptance of change	Work role suitability and EA training
Organisational role involvement	Involvement in managerial actions correlates positively with acceptance of change	Management ownership of EA

STRUCTURAL FACTORS – FORMAL AND INFORMAL		
Specialization (complexity and functional)	Diversity of specialists impact positively on acceptance of change	Work level- and work role acceptance of EA
Centralization	Centralized decision making are perceived as restrictive with decreased autonomy but more efficient	Included in EA implementation as a strategy
Formalization	Role and functional differentiation mean more precise work definition but less autonomy	Included in EA adoption
Informal networking	Informal information transfer between adopters of technology promotes diffusion	Human social interaction
TECHNOLOGICAL FACTORS		
Compatibility	Successful adoption depends on how compatible a new technology is to an organisation and the impact on its people	Difference between adoption and acceptance
Relative advantage	The advantage of the new technology compared to the as-is or another technology	'As-is' and 'to-be' understanding of EA
Complexity	Lack of information, skill and knowledge lead to resistance of new technology	Communication and EA training
TASK-RELATED FACTORS		
Task uncertainty	Difficult tasks may initiate motivation and usage of new technology or prevent implementation	EA communication: Use a common business and EA language
Autonomy	Self-regulation and personal work control lead to an increase in motivation, innovation, satisfaction and performance	Several human factors identified
Responsibility	More responsibility leads to motivation and acceptance	Accept responsibility for EA-related tasks
Variety	With more task variety comes better performance, more satisfaction and adoption, adaptation and usage	Included in EA-related tasks
Identity	Humans involved, associated and identifying with tasks tend to be more creative and satisfied	EA involvement and EA connotation
Feedback	Informing humans on performance and reinforced learning may result in increased creativity, satisfaction and better performance	Communication skills
ENVIRONMENTAL FACTORS		
Heterogeneity	In interacting, organisations have to adapt to a diverse environment	Organisational EA implementation (not individual specific)
Uncertainty	Environments are different and known ones may change. Uncertainty promotes innovation that may lead to growth	Organisational EA implementation (innovation may be individual or group specific)
Competition	Environmental issues such as scarcity of resources may result in competition and increased creativity	Organisational EA implementation (creativity may be individual or

		group specific)
Concentration/Dispersion	Adequate and concentrated resources facilitate learning and innovation, which lead to acceptance	Organisational EA implementation (research investigates role of EA acceptance in organisations)
Inter-organisational dependence	Sharing ideas and resources may lead to adoption, adaptation and diffusion of organisational innovation	EA acceptance – communication, cooperation

From the literature consulted (Kappelman, 2010b:35; TOGAF, 2009:744; Zachman, 1987:276) the adoption of EA may happen in one of the following ways:

- modern organisations realising and experiencing a need to align business, information technology, structure and people;
- an organisation in the process of re-evaluation, restructuring, or expanding may realise the need for assessing and recording some or all of its data, assets, processes, and knowledge to support a new mission;
- consultants or vendors may persuade organisations to consider new technology or upgrade existing systems and suggest EA as a methodology;
- organisations may consider accepting EA to gain cost-effective competitive advantage in a complex and fast-changing world; or
- organisations may need a basis for execution of business tasks supported by technology to build a strategy.

An enterprise can be seen as an ever-changing social environment. The nature of EA involves a structured and explicit description of the enterprise. According to Kappelman (2010b:35), the enterprise of the future will have to manage all its knowledge to be "agile, adaptable, interoperable, integrated, lean, secure, responsive, effective and efficient". Humans are responsible for adoption, acceptance and establishment of the use of EA in organisations. Considering respective work levels of human involvement in enterprises, roles and actions of employees as stakeholders in an enterprise should be evaluated to identify factors affecting acceptance of new directions such as EA.

Although the statement of Martin (1995:73) that *most large enterprises are in need of complete redesign* was made almost two decades ago, it is still valid as confirmed by Zachman (2012) when he states that enterprises in future will need architecture to handle complexity and change.

Adopting EA is the starting point of redesign when EA is used to describe the existing or 'as-is' state of the enterprise. EA as a basic strategy is subsequently used to describe the reengineering of the enterprise.

5.2.2.3 Human Factors Relating to Enterprise Architecture Acceptance

The problem with acceptance of EA as a foundation strategy to describe the state of the holistic enterprise came as a result of the perspective that EA is an IT issue. Studies of how EA was incorporated into enterprises reveal that although the need for business and IT integration was recognised by business leaders,

the responsibility for EA operations resided mostly in IT departments (Davenport, 1998:122; Ross *et al.*, 2006; Ross *et al.*, 2010:65). According to Schekkerman (2010), this is in many instances still the case today.

Ross *et al*. (2006:48) use the "operating model" (Figure 5.4) to distinguish between processes, data and IM, technologies and business environment relations and states that EA is used to describe *high-level business processes and IT requirements of the operating model of organisations*.

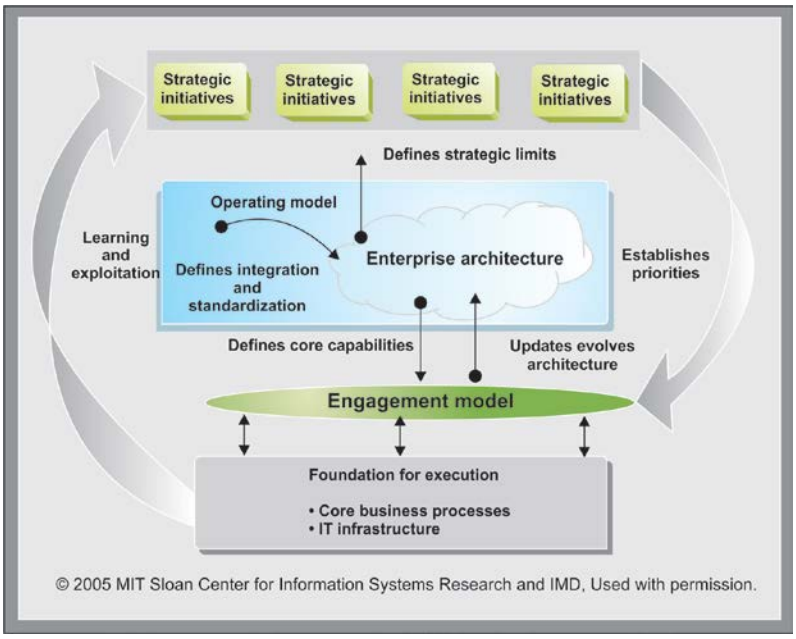


Figure 5.4: Creating and exploiting the foundation for execution (Ross *et al.*, 2006:10)

Often human resistance to accept new strategies such as EA can be traced back to the use of technology as a strategy to implement change or provide a 'quick fix' for problems. The result of having such distributed legacy systems is that people (especially from an IT work-level perspective) do not understand that in today's fast-changing business environment it is vital for enterprises to have a mechanism in place to show how change will affect their business. EA is the strategy to follow where IT and its architecture platform are described as enabling tools to establish the body of knowledge or repository necessary for an enterprise to maintain its competitive advantage and handle change (Kappelman, 2010b:36). Ross *et al*. (2006:8) explain three key factors of execution when integration of business processes and IT systems are addressed: business process integration in an operating model, EA and an IT engagement model. Humans across work levels are involved in such strategies and it is therefore important that humans accept organisational strategies such as EA. Finkelstein (2011:591) refers to how technology advancement sets the scene for creativity and innovation in organisational information engineering but argues that there are technology-independent phases of business planning, data modelling and process modelling.

EA addresses the complex integration of organisational business processes and technology advancement. The business of an organisation together with its technology-driven base, are however, not the only key to success. Information systems and the human dimension that is characteristic of such systems can lead to poor results and even the failure of a once successful business (Avison *et al.*, 2006:11).

One of the advantages of implementing EA as a strategy is that data, procedures and models in business, IM and IT processes are captured during the 'as-is' state of an enterprise and that this action of capturing and retaining is sustained for years throughout phases of normal organisational operation and change. EA is a platform for enterprise-wide description and knowledge conservation necessary for understanding, operation, reference purposes and change management (Kappelman, 2010:252). It is not only organisational documentation that needs to be retained but EA can also be a reference base for human knowledge. Nonaka & Takeuchi (1995:7) see knowledge as a "competitive resource". They distinguish between organisational knowledge embodied in documentation (explicit knowledge) and human knowledge about organisational processes (tacit knowledge) embodied in experience, values, and perspectives.

Lapalme (2012) distinguishes three belief systems in EA and show the difference in how they perceive the scope and purpose of EA. The scope and focus of the first belief system is to establish an enterprise IT platform with the purpose of supporting business needs. The belief of the second system is that an enterprise is a socio-technical system and EA is meant to explain how all systems, including business, IT and IM, are integrated. The third belief system has all the elements of the second one but includes an enterprise environment with the purpose of expediting innovation and adaptation through organisational learning.

Lapalme (2012a:37) uses the literature to connect some EA authors and their beliefs to his three belief systems. Perks & Beveridge (2003), Ross *et al*. (2006) and Finkelstein (1992) are classified as belonging to what he calls the *enterprise IT architecting school of thought.* Kappelman (2010) is representative of the enterprise integrating second school of thought and Gharajedaghi (1999), Hoogervorst (2009:428) and Martin (1995) are what Lapalme (2012a:37) lists as enterprise ecological adaptation thinkers. Lapalme (2012a:41) proposes his enterprise-in-environment approach if enterprises are to surmount modern challenges. *Innovation and adaptation to change* in a holistic approach is needed in enterprises to ensure their sustainability and competitive advantage. EA can be part of a strategic plan to assist enterprises on this journey.

The research reported on in this thesis, which is belief to support a holistic approach to EA acceptance in enterprises, relates to Lapalme's (2012a:37) second and third schools of thought and could assist enterprises when they focus on the management of human factors and EA acceptance.

Human factors related to EA acceptance was listed in Table 3.3. All human factors related to EA are combined into a set of human factors and listed in Section 5.2.2.4.

5.2.2.4 Combined Set of Human Factors Relating to EA

My research is concerned with the management of human factors in EA acceptance. Two factors of technology acceptance identified in the literature also apply to acceptance of EA as an organisational strategy – *perceived usefulness of EA as a strategy* and *subjective norm* (extracted from TAM and UTAUT). As stated in the main research question, the focus of the research is, however, *identifying human factors hindering EA acceptance* and *proposing a framework of how the human factors can be used in an organisation to promote EA acceptance*.

Table 5.7 provides a combined set of human factors related to EA identified from literature (Table 3.3, Section 3.7; sections 5.2.2.1 to 5.2.2.3.

Table 5.7: Other human factors from literature related to EA and used in the research

REFERENCES FROM LITERATURE TO OTHER HUMAN FACTORS	HUMAN FACTORS RELATED TO ENTERPRISE ARCHITECTURE	HUMAN FACTORS USED IN THE RESEARCH
Ross *et al*. (2006:200)	Discipline	Behavioural human factor
	Commitment to EA	Commitment
	Creativity	Behavioural human factor
	Senior management's responsibility for EA acceptance enforcement of EA governance	Management should accept ownership of EA
	Coordination	Behavioural human factor
	Communication	Behavioural human factor
Chuang and van Loggerenberg (2010:7)	Communication	Behavioural human factor
Markus (1983:430)	Self-examination	Behavioural human factor
Markus and Tanis (2000:201)	Communication	Communication
	Ownership of KPIs	Management should accept ownership of EA
	Stakeholder politics	Communication and collaboration
	Challenging of untested assumptions	Communication and collaboration
	Acceptance of the need to change	Outcome of the research (EA acceptance)
	Lack of long-term support	Understanding EA long-term vision
	Gaps in knowledge and skills	EA training
	Flexibility	Open-mindedness
Vithessonthi (2009:56)	Attitude	TAM and behavioural human factor
Schein (2004:7), Menghua *et al*. (2013:52), Strong and Volkoff (2010:745)	Organisational culture and discipline	Exploratory study explanation
Magda (2009:11)	Top-level support	Management support for EA
	Communication	Communication
	Training and education	EA training
	Consideration and involvement of the target users	Stakeholder involvement
Sage (2006:109)	Behavioural dimension	Behavioural human factors
Jeyaraj *et al*. (2006:6)	Perceived usefulness	Perceived usefulness of EA

REFERENCES FROM LITERATURE TO OTHER HUMAN FACTORS	HUMAN FACTORS RELATED TO ENTERPRISE ARCHITECTURE	HUMAN FACTORS USED IN THE RESEARCH
	Top management support	Top management support
	Computer experience	Not directly applicable to research
	User support	EA user support
	Behavioural intention	Behavioural intention
Kwon and Zmud (1987:233)	Extracted from Table 5.6	Management ownership of EA Human social interaction 'As-is' and 'to-be' understanding of EA Communication and EA training EA communication: Use a common business and EA language Behavioural factors: motivation, innovation, satisfaction and performance Accept responsibility for EA-related tasks EA involvement Communication skills

Following a literature investigation of human factors described in EA frameworks, it was found that although EA frameworks acknowledge the socio-technical milieu of organisations, human factors affecting the acceptance of EA in complex organisations have not explicitly been described. The Zachman Enterprise Framework, the Open Group Architecture Framework (TOGAF) and The Generalised Enterprise Reference Architecture Framework and Methodology (GERAM) were used as reference frameworks to justify this argument.

In Section 5.2.2.5 the literature is used to describe the human factors identified in three different EA frameworks.

5.2.2.5 Human Role as Defined in Enterprise Architecture Frameworks

Enterprises are not only 'business' entities – enterprises are compositions of social groups or humans, working together towards achieving common goals. Nemeth (2012) confirms that enterprises are *human systems* and not *systems with humans*. He describes human systems as *adaptive and resilient* and proposes the utilisation of human cooperation and the understanding of human performance as means to drive and manage change (Nemeth, 2012). This research corroborates the findings of Nemeth (2012) by claiming that EA encloses not only a *business and information management with IT support* view but that enterprises need to consider individual human- and human-group conceptualisation and acceptance of EA. It will be shown that human factors in organisations form an integral part of this process.

According to Ross *et al.* (2006:204), acceptance and implementation of EA help to motivate and energise the main asset of an organisation – its people. Brooks (1995:276) states that in software engineering the emphasis should be more on the quality of people, how they are organised and managed rather than on technical issues and tools. Enterprises should concentrate on enhancing people's creativity and ideas. According to Nemeth (2012), systems are extensions of human ability and creativity and therefore human needs, roles and performance should be understood.

Zachman and TOGAF as EA support entities are two of the frameworks widely used in industry today and an overview of these two frameworks was presented in Chapter 2. GERAM was chosen as a reference framework in my research for its explicit view on the importance of human-oriented concepts during enterprise design, construction, operation and change (sections 2.5 and 2.5.2). The role of humans and human factors referred to in these frameworks have been identified and will be discussed in sections 5.2.2.5.1 to 5.2.2.5.3.

5.2.2.5.1 Human Factors as supported by The Zachman Framework for Enterprise Architecture

The Zachman Framework for Enterprise Architecture (2008a; Zachman, 2011a) is a schema that lists and describes a set of representations and different perspectives (Figure 2.2). Human work roles are named according to their respective functions in an enterprise. In the Who-representation of The Zachman Framework for Enterprise Architecture, responsibilities of human participants in an enterprise are identified. Zachman (2009) highlights three areas of culture in an organisation that will be affected when EA is adopted as a strategy. These three areas of culture are values, behaviour and technology. Zachman (2009) advocates for cultural change in enterprises when EA is adopted and describes how the 'as-is' and 'to-be' states of an enterprise's values, behaviour and technology are affected. Examples of such changes are: value changes from short -term values to long-term values and expense-based values changing to asset-based values; changing behaviour from application-based- to enterprise-model based and manual methods to automated design; changing platform-based technology to open-system based technology and code generation to modelling. Humans often resist organisational cultural change because of inability, uncertainty and unwillingness. Zachman explains the roles and responsibilities of people in a broad sense, according to their work-role perspectives as described in his framework (Figure 2.2).

According to Zachman (2009), the *new paradigm is not about technology; it is about engineering the enterprise and facilitating culture change*. Culture change in enterprises happens when processes are redesigned and measured and managers opt to facilitate and involve all stakeholders. Proving the concept of EA by introducing change in a step-wise manner, showing regular, valuable results, and using a common language to facilitate understanding are practical ways of handling culture change.

Although The Zachman Framework for Enterprise Architecture is not a methodology and Zachman (2010c:97) does not explicitly discuss human factors affecting EA acceptance, he describes the importance of human roles and actions when he speaks about *observations of methodology*.

The Zachman statements (Zachman, 2010c) relevant to my research were analysed by using the technique of content analysis (Section 4.7.3). The Zachman statements and my abstraction of human factors are listed in Table 5.8, columns one and two respectively.

Table 5.8: Zachman statements concerning human involvement in EA

ZACHMAN STATEMENTS	HUMAN FACTORS ABSTRACTED FROM ZACHMAN STATEMENTS
People have to state their definition of "enterprise"	• Use a simple and commonly understood business and EA language
Describe reason for EA	• Communicate and understand the reason for using EA to describe business, IM and IT process integration
Adopt a consistent EA language	• Stakeholders should use and understand EA concepts and EA language
Define the enterprise change process (engineering)	• Management and stakeholders should share and understand the 'as-is' and 'to-be' roadmap of the organisation
State the purpose for EA ('as-is' and 'to-be')	• Communicate the EA benefits of business, IM and IT integration for specific purposes and needs such as addressing user and stakeholder requirements, managing change and organisational growth • Management and stakeholders should share and understand the 'as-is' and 'to-be' roadmap of the organisation • Understand and share the long-term vision associated with EA
Resistance-management problems	• Lack of vision, understanding, communication, risk taking, time, and resistance management • Understanding user and stakeholder concerns • Continuous sharing of the perceived and real value of EA • Share positive and negative results • Human interaction is needed in EA initiatives across different work levels
Commitment to EA and change	• Management should facilitate and manage transformation and cultural change after adoption of EA as an organisational strategy • Support for EA should be organisation-wide • Early identification of possible human-related risks and human acceptance of EA as an organisational support strategy • Acknowledge and utilise cultural differences when called for in EA initiatives
Perseverance	• Show perseverance with projects and processes when organisational change happens and accept that change will continuously happen
Being facilitators and not directors	• Enterprise architects should act as facilitators of EA • EA team members should provide for EA guidance and not only concentrate on EA governance • The need and importance of good interaction should be understood by all managers, architects, stakeholders and users • Acknowledge and allow stakeholders'- and users' initiatives in support of EA
Establish an enterprise change process	• Managers should take responsibility and ownership of EA • EA users and stakeholders should take responsibility for EA tasks, processes and projects • Allow for flexibility in processes and projects

ZACHMAN STATEMENTS	HUMAN FACTORS ABSTRACTED FROM ZACHMAN STATEMENTS
Culture change	• Personal, group and organisational dynamics are needed in EA initiatives
Shared vision	• Management and stakeholders should share and understand the 'as-is' and 'to-be' roadmap of the organisation • Stakeholders and users should agree to follow standardise EA procedures
Admit there is a problem and share problems	• Provide feedback on EA tasks and report on EA results • Share information across different work levels
Set realistic expectations	• Managers, stakeholders and users should have realistic expectations of EA and allow for long-term EA benefits
Prove the concept	• EA engagement is needed by all EA stakeholders • Stakeholders and users should be able to identify reusable information
Use symptomatic solutions to buy time	• Share EA motives and small EA victories
Decide on the analytical target	• Understand the long-term vision • EA analytical skills have to be implemented practically
Understand the implications of EA	• Understand the 'as-is' – 'to-be' roadmap of the organisation • Demonstrate compliance with 'EA-way' of work • EA engagement is needed by stakeholders
Accurately reflecting your intent	• Management and stakeholders should share EA motives • Stakeholders should share knowledge and information about EA • Stakeholders should allow for information retention and preservation
Accept ownership of EA	• Managers should take responsibility and ownership of EA • Stakeholders and users should understand the importance of their work roles in EA initiatives such as modelling, standardisation and optimisation of EA processes
Assess, adopt and adjust	• Stakeholders should commit to continuous validity checking of EA guidelines • EA stakeholders should be open-minded and participate, coordinate and cooperate when EA initiatives need to be adjusted
Ensure that enterprise acquires skills, capabilities and tools	• Stakeholders should be prepared to accept and provide EA and work-related skills training • Management should accept ownership of EA and provide for tools and training • Accepting EA is the responsibility of management and all other stakeholders
Measure the process not the people	• Humans should have trust in self, co-workers and management
Compromise	• Human input in EA initiatives should be acknowledged • Humans are responsible for the coordination of EA processes • Good social relationships, interpersonal networking and human cooperation expedite EA acceptance

5.2.2.5.2 Human Factors as supported by The Open Group Architecture Framework

TOGAF is an architecture methodology or process-based model that provides enterprises with the methods and tools for assisting in adoption, production, use and maintenance of EA. Owing to the practice-oriented- and technology-focused nature of TOGAF, reference to human involvement focuses more on the individual(s) responsible for the implementation of EA in organisations (Dietz *et al.*, 2011:1). TOGAF (2009:645) refers to "architecture compliance" and concentrates its guidelines for EA implementation on the work functions of the architect or architectural board. TOGAF (2009:691) defines an architecture skills framework that provides and defines the roles, skills and knowledge needed for architecture work (Section 2.5.2). The focus of the TOGAF architecture skills framework is on members of the architecture team and can include roles such as board member, sponsor, architecture manager, architects (enterprise, business, data, technology, application), programme manager, project manager, IT designer and others (TOGAF, 2009:694).

TOGAF methodology recognises stakeholder concerns as a starting point for EA adoption and implementation (Section 2.5.2). TOGAF (2009:282) briefly addresses different stakeholders' concerns when EA is adopted as a strategy to assist in change management. Typical concerns may include questions such as: Who gains from this change and who loses? Who is in control of the change management processes? Who designs the new systems? Who controls resources? Who has the needed specialist skills? Different stakeholder views of the business, IM and IT integration of an enterprise need to be addressed and explained by the architect and the programme/project managers. Stakeholders' perceptions, called *viewpoints*, may be combined to produce views describing architecture (TOGAF, 2009:419). Although stakeholders can include both people and organisations, TOGAF (2009:284) distinguishes between five broad categories of people internally involved in organisations as stakeholders of EA: corporate involvement; end-user involvement; project involvement; systems operations involvement; and external involvement. In its discussion on stakeholder management, TOGAF (2009:281) lists the following steps of engagement with stakeholders to ensure their support when EA is implemented (human factors important to the research are highlighted using italics):

- Early identification of stakeholders and utilisation of their knowledge.

  Stakeholders can be classified according to power and interest.

- Early and frequent *communication*.

  TOGAF (2009:285) advocates levels of communication according to power and interest: key players need to participate and be fully informed; others need only to be kept informed and satisfied.

- Capitalisation of positive *stakeholder reaction* and avoidance of or addressing negative reactions.
- One of the factors hindering stakeholder involvement in EA is *common understanding of terminology*, for example, differentiating between the meaning of the word "architecture" in EA, software and computer technology.

If one considers that human organisational requirements management forms the core of the TOGAF ADM, it is expected to find human roles described in TOGAF (Figure 2.5). The focus of TOGAF, however, is mainly on business process management, data- and IS management, and IT management and very little attention is

given to human factors and their impact on EA. In their process of how to create a business scenario, "actors" have to be identified and their roles, responsibilities and measures of success have to be documented (2009:303). Architecture governance happens alongside corporate, IT and technology governance. TOGAF does not provide specific human factors impacting on EA acceptance but distinguishes between generic skills, business skills, EA skills, programme- and project management skills, general knowledge skills, technical skills and legal-environment skills for the different roles. Generic skills categories include categories of human factors; for example, leadership skills, teamwork skills, interpersonal skills, communication skills (oral and written), logical analysis skills, stakeholder management skills and risk management skills.

Human-related characteristics relevant for corporate governance adopted from Naidoo (In: (TOGAF, 2009:672)) are discipline, transparency, independence, accountability, responsibility and fairness. Enterprise role and skill categories listed by TOGAF have been described earlier (Section 2.5.2) (TOGAF, 2009:695).

TOGAF does not list specific human factors for different EA work roles but TOGAF describes the role of the enterprise architect in more detail and the following human factors important for enterprise architects are listed and highlighted in italics (2009:701):

- The enterprise architect should *understand the culture and vision of the organisation* to identify the business, IT and IM integration needs and assist throughout in realising the capabilities to meet those needs.
- The enterprise architect acts as a *mediator* between technology implementers and business leaders and coordinates, manages, assesses and validates the changes that are caused by architecture tasks and implementation.
- The enterprise architect assists in setting an organisation–wide *definition of EA* that is acceptable to all stakeholders.
- The enterprise architect probes and *listens to useful user and stakeholder information and needs,* and translates the ideas and information into EA requirements.
- The enterprise architect coordinates human- and work role diversity and fosters EA engagement and EA vision.
- The enterprise architect *understands* the difference between organisational and *stakeholder wants and needs*.
- The enterprise architect use and promote the *use of a common EA language*.
- The enterprise architect *demonstrates EA support for stakeholders* and *provides EA guidance* to people from all work levels.
- The enterprise architect establishes a *collaborative EA environment*.
- The enterprise architect is able to *conceptualis*e future EA ideas.
- The enterprise architect shows continuous *dedication* for EA.
- The enterprise architect should be able to *interact* with business leaders, managers, technical stakeholders and workers.

Human factors identified from TOGAF through the use of content analysis are listed in Table 5.9.

5.2.2.5.3 Human Factors as supported by the Generalised Enterprise Reference Architecture Methodology

In general the GERAM framework proposes modelling constructs to describe human roles, their human and technology interaction in EA, and the capabilities and qualities of humans in EA (GERAM, 1999:8). According to GERAM (1999:8), the role of humans in enterprises is fundamental and different human factors, describing the qualities and capabilities of humans have to be defined and managed. Human role models and human professions are described in the partial enterprise models (PEMs) and enterprise modules (EMOs) of the GERAM framework (Figure 2.8). The scope of PEMs includes models of human roles, skills and competencies in operations and management of enterprises. "EMOs" refers to products such as human resources where specific professions with their accompanying skill- and capability requirements are described.

In the enterprise engineering methodology (EEM) of GERAM (Figure 2.8), humans and human factors are recognised as a major part in the success of an organisation's transition from old to new or improved systems. It is suggested that human involvement and automation are described in the design phase of an enterprise engineering process for the three areas of mission support architecture, human and organisational architecture, and management and control of information systems architecture (GERAM, 1999:24).

The GERA (Generalised Enterprise Reference Architecture) component of GERAM recognises human involvement as fundamental in integration of business, information and technology processes. Integration happens through enterprise engineering or enterprise re-engineering and GERA recommends the definition of human work roles and skills as well as using a commonly understood language (Figure 2.8). More specifically, GERA advocates that capabilities and qualities of people involved in organisational and operational business, information and technology processes should be described. Also, the ways in which people interact with others and with technology have to be described.

Humans in work roles and who take responsibility are considered an organisational asset. Often humans accept more and other responsibilities than only those required by their working role. Knowledge management models, social processes, methodologies and tools for capturing and re-use of human knowledge across work roles should be in place for large organisations according to GERA (GERAM, 1999).

The argument of GERA (GERAM, 1999) is that knowledge of human factors identified in the models and methodologies may have the following advantages for an organisation:

- timely response to market opportunities and environmental change;
- better handling of business reengineering processes;
- better management and utilisation of resources when new products are launched or services are implemented; or
- not being affected too much by the loss of core human competencies.

GERAM specifies only generic groups of human factors of importance in their EA and engineering construction models and methodologies – for example: human roles, skills, competencies, capabilities, responsibilities, experience and tasks (Zachman, 1999:454).

Human factors identified from GERAM through the use of content analysis are listed in Table 5.9.

5.2.2.5.4 Combined Set of Human Factors Identified from EA and EA Frameworks

Table 5.9 provides a summary of human factors identified from The Zachman Framework for Enterprise Architecture, TOGAF and GERAM frameworks.

Table 5.9 Human factors identified from three EA and EA frameworks

HUMAN FACTORS	ZACHMAN FRAME-WORK FOR ENTER-PRISE ARCHI-TECTURE	TOGAF	GERAM	EA RELATED
Understand, facilitate and manage transformation and culture change – engineering	X		X	X
Understand enterprise culture, vision and principles	X	X		
Use a common definition and description of EA	X	X		X
Acknowledge need for and benefits of EA	X	X	X	X
Promote universal understanding of purpose for EA	X			
Understanding need for business, IM and IT integration	X	X	X	
Understanding of stakeholders' and users' concerns	X	X	X	
Interaction: Involve all stakeholders, address their needs and share motives, problems and small victories – shared vision	X		X	X
Foster engagement into EA	X	X		
Communication: request early and continuous updates	X	X	X	X
Communication skills – accurate reflection of intentions, information flow, allow decisions to filter through	X		X	X
Knowledge sharing across work levels	X			
Understand long term ROI of EA and share long term vision	X	X		X
Accept ownership of business and IM alignment	X		X	X
Continuous adaptation (short term) and conformation of process (long term) –	X			

HUMAN FACTORS	ZACHMAN FRAME-WORK FOR ENTER-PRISE ARCHI-TECTURE	TOGAF	GERAM	EA RELATED
perseverance				
Follow ‘as-is’ and ‘to-be’ roadmap	X	X	X	X
Realistic expectations - continuously share benefits and results of EA	X			
Acknowledge human input and effort	X		X	
Follow standardised procedures	X	X	X	
Enterprise architect’s role as mediator	X	X		
Coordinate diversity and change	X	X		
Think analytically, implement practically	X	X		
Understand that metamodels is needed to describe how and with what EA will be described	X	X	X	
Establish future architecture vision and definition	X	X		
Facilitate architectural modelling and implementation	X	X	X	
Understand work role importance - commitment	X		X	X
Understand the difference between solution architecture with a purpose and organisation-wide EA	X		X	
Users and stakeholders are responsible for retaining and reuse of information	X	X	X	
Collaborate and promote team work	X	X		
Optimise and standardise – skills, capabilities, tools and services	X	X		
Facilitate stakeholder involvement, cooperation and understanding	X	X	X	X
Accept responsibility and accountability	X	X	X	
Facilitate EA buy-in, participation, cooperation and support	X	X		
Open-minded (flexibility)				X
EA training				X

5.2.2.6 Human Factors Identified from Technology-acceptance Models and Related Theories

The literature was also used to investigate technology-acceptance models and theories described for organisations to identify incidence of common human factors (sections 3.4.2, 3.4.3, 3.4.4 and 3.5). Human factors from models and theories were identified and listed in tables 3.1 to 3.3. Table 5.10 provides a

summary of human factors from these tables and an indication of human factors used in the research. Some of the human factors (marked with a *) were excluded because they were found either to be: i) synonymous with "acceptance" or "work level involvement" (which had to be proved in the research); ii) not dominating problematic factors anymore (for example, human use of technology or information) (Horrigan, 2009:3; Jasperson *et al.*, 2005:525; Venkatesh *et al.*, 2012:160; Wu *et al.*, 2011:50); iii) not directly applicable to the research; or iv) typified by other factors.

After investigation of human factors and consideration of the literature context of the human factors (for example technology acceptance), the human factors of four of the listed models and theories were found to be relevant to the research for the following reasons: all human factors listed in the other models and theories are human factors either identified in the exploratory study or human factors already included in these four models and theories used for the research; human factors listed were not directly applicable to the research. Factors described in the four models and theories (TAM, UTAUT, ANT and ST) found to be aligned with the research focus are highlighted by using italics in Table 5.10.

Table 5.10: Human factors identified from models and theories

REFERENCES TO MODELS, ACCEPTANCE MODELS, FRAMEWORKS AND THEORIES	HUMAN FACTORS IDENTIFIED FROM ACCEPTANCE MODELS AND FRAMEWORKS	HUMAN FACTORS USED IN THE RESEARCH
Theory of Reasoned Action (TRA) (Venkatesh *et al.*, 2003:425)	Attitude	Behavioural intent – identified in TAM, UTAUT
	Subjective norm	TAM
Technology Acceptance Model (TAM), TAM2 and TAM3 (Davis, 1989a:319; Venkatesh *et al.*, 2003:425; Venkatesh *et al.*, 2008:273; Venkatesh *et al.*, 2008:273)	Perceived usefulness	*Perceived usefulness*
	Perceived ease of use*	
	Behavioural intent or Subjective norm	*Behavioural intent / Subjective norm*
Extension of TAM ((Díez *et al.*, 2009:588))	User involvement and participation	Human factors related to EA used in the research: • *User involvement and participation*
	IS professionalism	• *IS professionalism*
	Subjective norm	• *Subjective norm*
	Management and user support	• *Management and user support*
	Training	• *Training*
	Computational experience* External pressure* External information sources*	

REFERENCES TO MODELS, ACCEPTANCE MODELS, FRAMEWORKS AND THEORIES	HUMAN FACTORS IDENTIFIED FROM ACCEPTANCE MODELS AND FRAMEWORKS	HUMAN FACTORS USED IN THE RESEARCH
	Quality of system*	
Motivational Model (MM) (Venkatesh *et al.*, 2003:425)	Extrinsic motivational factors*	Research does not focus on extrinsic motivational factors such as remuneration, etc.
	Intrinsic motivational factors	Intrinsic motivation is an encompassing concept for some of the human factors identified and included in the research
Theory of Planned Behaviour (TPB) (Ajzen, 1991:179; Ajzen *et al.*, 2009:1356)	Intention of behaviour	TAM, UTAUT
	Attitude	TAM
	Perceived behavioural control	Identified in exploratory study
	Implementation Intention	Identified in exploratory study
	Commitment	Identified in exploratory study
	Conscientiousness	Behavioural intent
Model of PC Utilization (MPCU) (Venkatesh *et al.*, 2003:425)	Relevance of usage in work situation	Perceived usefulness - TAM
	Difficulty of understanding and use	Identified in exploratory study
	Long-term benefit	Identified in exploratory study
	Affectivity	Identified in exploratory study
	Social behaviour	Identified in exploratory study
	Facilitation of environmental issues	Identified in exploratory study
Innovation Diffusion Theory (IDT) (Venkatesh *et al.*, 2003:425)	Relative advantage	Identified in exploratory study
	System in organisation visibility	Identified in exploratory study
	Manifestation of results	Identified in exploratory study
	Voluntariness of use as described by the innovation diffusion theory	Identified in exploratory study
	Ease of use* Advancement of social status* Compatibility* Trialability*	Not directly applicable to EA in organisations
Social Cognitive Theory (SCT) (Venkatesh *et al.*, 2003:425)	Performance and personal expectations of outcome in the working environment	Identified in exploratory study
	Self-efficacy	Identified in exploratory study

REFERENCES TO MODELS, ACCEPTANCE MODELS, FRAMEWORKS AND THEORIES	HUMAN FACTORS IDENTIFIED FROM ACCEPTANCE MODELS AND FRAMEWORKS	HUMAN FACTORS USED IN THE RESEARCH
	Affect	Identified in exploratory study
	Anxiety	Identified in exploratory study
Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003:425)	User intention factors: • Performance expectancy • Effort expectancy • Social influence Facilitating conditions impact on use behaviour Human factors: • Gender* • Age* • Experience • Voluntariness of use*	Specific human factors of UTAUT used in the research: • *Performance and personal expectations of outcome in the working environment* • *Difficulty of understanding and use* • *Relevance of usage in work situation* • *Long-term benefit* • *Affectivity* • *Social behaviour* • *Relative advantage* • *System in organisation visibility* • *Compatibility* • *Manifestation of results* • *Self-efficacy* • *Affect* • *Anxiety*
Social Actor Model (Lamb *et al.*, 2003:197; Wong *et al.*, 2009:1)	Identity of humans	Identified in exploratory study
	Interaction	Identified in exploratory study
	Affiliation with usage	Identified in exploratory study
	Environment of use	Identified in exploratory study
Actor Network Theory (ANT) (Callon *et al.*, 1981:277; Callon, 1986:196; Callon, 1999:181)	Human use of information	Human factors from ANT used in the research: • *Human use of information*
	Human fit in organisations	• *Human fit in organisations*
	Tacit human knowledge and distribution	• *Tacit human knowledge and distribution*
	Politics	• *Politics*
	Culture	• *Culture*
	Human use of technology* Moral issues*	
Structuration Theory (ST) (Giddens, 1981:161; Giddens, 1984; Jones *et al.*, 2008:308)	Structure: • Organisational • Domination • Legitimation	Human factors from ST used in the research:
	Interaction: • Communication • Power • Sanction	• *Interaction* • *Communication* • *Power* • *Sanction* • *Knowledge sharing*

REFERENCES TO MODELS, ACCEPTANCE MODELS, FRAMEWORKS AND THEORIES	HUMAN FACTORS IDENTIFIED FROM ACCEPTANCE MODELS AND FRAMEWORKS	HUMAN FACTORS USED IN THE RESEARCH
	Responsibility for own actions	• *Responsibility for own actions*
	Trust	• *Trust*
	Voluntarism*	

Some human factors from the acceptance models concurred with human factors from the exploratory study. In execution of SO1.1 (To determine the human factors affecting EA acceptance), human factors from acceptance models and theories were combined with human factors from the exploratory study to compile a comprehensive list of human factors.

5.2.3 Integrated List of Human Factors

After completion of the exploratory study and the literature study to identify human factors related to EA acceptance, the factors were integrated and a combined list of human factors was composed, as presented in Table 5.11

Table 5.11 Combined list of human factors related to EA acceptance

HUMAN FACTOR	ZACHMAN	TOGAF	GERAM	EA	TECHNOLOGY ACCEPTANCE	EXPLORATORY STUDY
Facilitate and manage transformation and culture change – engineering	X		X	X		X
Interaction: Involve all stakeholders, address their needs and share motives, problems and small victories	X		X			X
Use of common EA language	X			X		X
Communication: request early and continuous updates	X	X	X	X		X
Business and technology, human inclusive view	X	X	X		X	X
Demonstrate support (accept and provide)	X	X		X	X	X
Perceived benefits and competitive advantages	X	X	X		X	X
Understand long term ROI of EA and share long term vision	X	X		X		X
Risk management and financing	X	X				X

HUMAN FACTOR	ZACHMAN	TOGAF	GERAM	EA	TECHNOLOGY ACCEPTANCE	EXPLORATORY STUDY
Proof of personal strength and leadership skills						X
Decision making	X	X	X			X
Personal and organisational (group) dynamics	X					X
Involvement	X		X	X		X
Acknowledge human input and effort	X		X		X	X
Accept ownership of business and IM alignment	X		X	X		X
Continuous adaptation (short term) and conformation of process (long term)	X					X
Follow "as is" and "to be" roadmap	X	X	X	X		X
Realistic expectations - continuously share benefits and results of EA	X					X
Follow standardised procedures	X		X			X
Acknowledge maturity level differences						X
Understand and deal with global issues						X
Patience and perseverance	X					X
Open-minded and accept input and innovative ideas from stakeholders (flexible)				X		X
Integrity, honesty and ethical behaviour						X
Share knowledge with architects	X			X		X
Professionalism	X	X				X
Understanding “business”, IM and IT AND stakeholders’ and users’ concerns	X	X	X			X
Mediator	X	X				X
Communication skills – accurate reflection of intentions, information flow, allow decisions to filter through	X		X	X		X
Perseverance	X					X
Patience	X					X
Dedication	X					X
Coordinate diversity and change	X					X
Guidance	X	X				X
Continuous validity checking	X	X				X
Understand enterprise culture, vision and principles	X	X		X		X
Conceptualise	X	X				X
Think analytically, implement practically	X	X				X

HUMAN FACTOR	ZACHMAN	TOGAF	GERAM	EA	TECHNOLOGY ACCEPTANCE	EXPLORATORY STUDY
Understand EA metamodels	X	X	X			X
Passion						X
Prepared to accept EA challenge				X		X
EA guidance rather than governance						X
Foster engagement into EA	X	X		X		X
Identify reusable information	X	X	X			X
Resolving conflict	X	X				X
Collaborate and promote team work	X	X				X
Leadership and teamwork skills		X		X		X
Share knowledge and provide training	X	X	X	X		X
Advisor	X	X				X
Establish future architecture vision and definition	X	X				X
Acknowledge and understand “business”, IM and IT viewpoint	X		X	X		X
Solutions architecture with a purpose – based on design objectives	X		X			X
Accept responsibility and accountability		X	X	X		X
Facilitate stakeholder involvement, cooperation and understanding	X		X	X		X
Feedback and frequent results	X					X
Adapt and adjust to EA when needed (flexible)	X		X			X
Enable information exchange and preservation	X	X	X			X
Create collaboration opportunities and educate employees				X	X	X
Facilitate architectural modelling and implementation	X	X	X			X
Share some knowledge and skills but all information	X	X			X	X
Cooperate	X				X	X
Team dynamics						X
Understand balance between needs, quality of work and expenditure on resources		X				X
Optimise and standardise – equipment and services	X	X				X
Stay focused						X
Acknowledge user/stakeholder requirements	X	X				X
Retain and reuse of information resources	X	X	X			X

HUMAN FACTOR	ZACHMAN	TOGAF	GERAM	EA	TECHNOLOGY ACCEPTANCE	EXPLORATORY STUDY
Understand work role importance	X	X	X		X	X
Interaction and social networking					X	X
Accept cultural change	X			X		X
Trust						X
Accept authority and shared values			X		X	X
Acknowledge EA	X	X	X	X		X
Participate	X	X			X	X
Patience	X				X	X
Perseverance	X				X	X
Loyalty						X
Focus on enterprise priorities	X				X	X
Honesty						X
Engagement					X	X
Perceived usefulness	X			X	X	X
Accept and provide training	X			X	X	X
Positive Attitude				X	X	X
Subjective norm					X	X
Self-efficacy				X	X	X
Anxiety						X
Remuneration of effort expectation					X	X
Satisfaction – expectation, disconfirmation, performance					X	X
Group/organisation affiliation and dynamics	X		X		X	X

5.3 CLASSIFICATION SCHEME FOR HUMAN FACTORS

The comprehensive list of unclassified human factors identified from the exploratory study and the literature was just an unordered list and had to be analysed and classified. A classification scheme for the human factors had to be established.

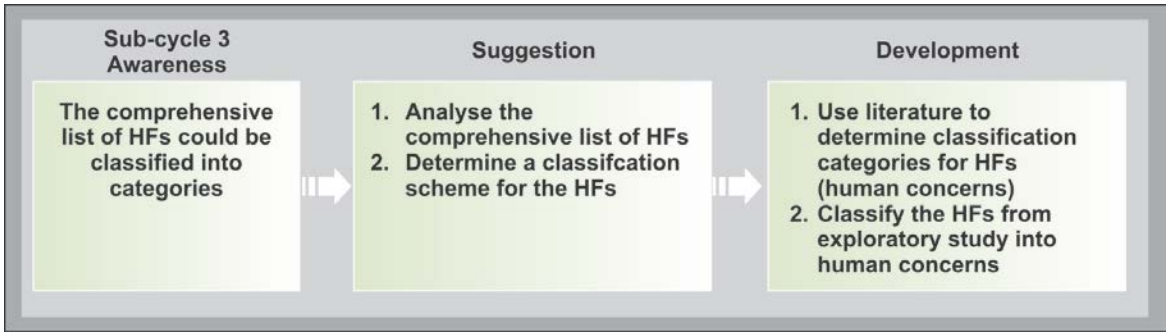


Figure 5.5: Design research Sub-cycle 3

The combined list of human factors identified from the exploratory and literature studies could be grouped into meaningful categories. Through meetings with EA practitioners and specialists (EARF, 2009) and by consulting the literature (Ballangee, 2010a:30; Hoogervorst, 2009:83, 107, 194, 267; Sage, 2006:138; Schekkerman, 2004c:26), themes in EA that could be used to categorise human factors were identified. The categories identified were named "EA human concerns" (EAHCs). Many human concerns (HCs) of which communication is an example, have been described in organisational management, technology acceptance and enterprise systems management (Amoroso *et al.*, 2007:245; Brooks, 1995; Chuang *et al.*, 2010; De Souza *et al.*, 2009; Friedland *et al.*, 2011:66; Kling, 1980:61; Markus, 1983:430; Robles, 2012:453; Schein, 2004:437; Schumacher, 1993; Sellen *et al.*, 2009:58; Wickramasinghe *et al.*, 2012:982; Zacarias *et al.*, 2010:441). Some of the human factors identified from the exploratory responses indicated meaningful categories for example: *use a commonly understood EA language, share positive and negative EA result* and *allow decisions to filter through to people* could be categorised as communication and *human cooperation is needed in EA related tasks, projects and processes* could be categorised as cooperation. Six identified categories (EAHCs) relevant to the research emerged as meaningful namely communication, coordination, cooperation, collaboration, connotation and commitment. The six EAHCs are graphically illustrated in Figure 5.6.

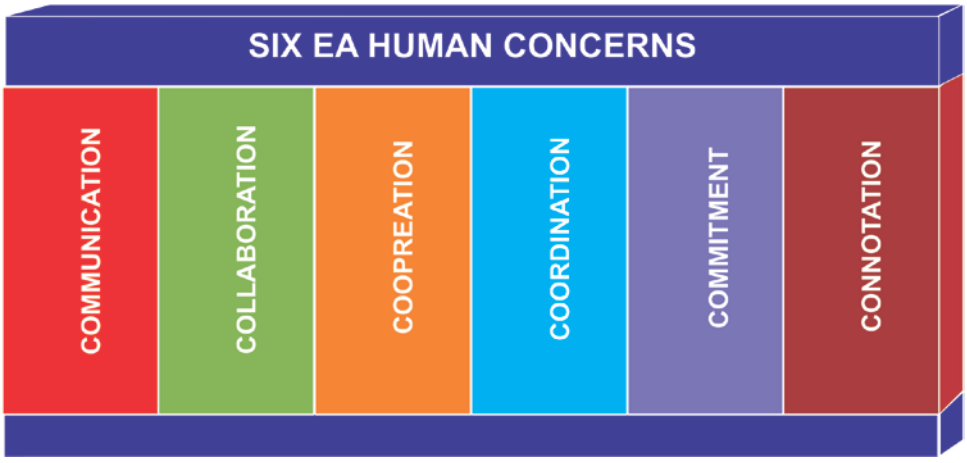


Figure 5.6: The six EA human concerns (EAHCs)

A brief discussion of each concern to explain its conceptual meaning for the purpose of the research is provided in sections 5.3.1.1 to 5.3.1.6.

5.3.1.1 Communication

Communication can be described as sending and receiving of a message by implementing various and different means. Sunaga (2012:25) defines communication as *the narrative sense making of individuals that happens via the signifying ensemble during interaction*, and explains that context or external conditions such as physical space of communication may influence the act of communication but that interaction signifies *exchanges between humans*.

In effective communication, the process consists of four components: a sender of a message; a receiver of a message; a message or information; a means of conveying a message. The process can be described as a sender sending or encoding a message to a receiver by using a specific means. The receiver receives or decodes the message. Only if the receiver is able to acknowledge that the message was received, interprets it and responds to the sender (gives feedback) by repeating the message and an agreement is reached on the content of the message, can the communication be classified as successful (Huebsch, 1995:4; Robbins, 2004:300).

Communication can be classified and directed in many ways. Communication can be direct (e.g. face to face) or indirect (e.g. e-mail). Means of communication include written, typed, read, spoken, listened to, graphical and non-verbal (body language and gestures). Communication in organisations may happen between individuals and may be directed downward (management to employees), upward (employees to management) or lateral (between members of an organisational group) (Robbins, 2004:300).

Robbins (2004:305) describes formal networks, the grapevine, computer-aided communication (social networks, e-mail, video conferencing, etc.), and knowledge management as methods of communication in organisations but also lists important barriers to effective communication. Filtering occurs when information is adjusted to be perceived better. Information is perceived selectively and interpreted not as it factually is but 'how and what the receiver is'. Information overload leads to selection or even ignorance. One barrier to communication of interest to my study is what Robbins (2004:317) refers to as an awareness *that people in organisations severely limit their oral communication and justify their behaviour by saying that more communication isn't necessary for them to do their job*. Forms of non-verbal communication not often considered as influencing information exchange in organisations are silence, attitude, time, socio-cultural issues and physical working environment. Robbins (2004:299) explains how communication can foster worker motivation. Communication can clarify work tasks, show appreciation for good work performance and explain how to improve performance.

In a study by Robles (2012:455) the two skills of communication and integrity were indicated as the most important 'soft' skills for employees.

The New Agenda Model of Communication in Knowledge-Intensive Work Communities (Juholin, 2007:13) includes the following six dimensions: 1) sharing and discussion of the big issues of the organisation and its operational environment; 2) receiving and sharing topical information and strengthening partnership for

change; 3) creation of a common atmosphere; 4) participation and influence in the work community; 5) doing and learning together; and 6) managing and reflecting upon reputation. All of the six mentioned dimensions are performed through identification and utilisation of new communication forums. Although the model of Juholin was not specifically designed for an EA context, all six dimensions would apply for the business-IM-IT alignment work-community in an organisation.

For the purpose of my research, the means of communication are human based and human directed. According to Schekkerman (2004a:88), communication is one of the basic problems that EA is facing. Communication and communication skills may play a significant role when EA acceptance in organisations is concerned. In a panel discussion between some of EA's pioneers, Sowell (2010a:25) stressed the fact that EA is a human-driven endeavour. Effective communication amongst other human factors such as accountability and responsibility underlies the success of EA as an organisational strategy (Kappelman, 2010a:25; Kappelman, 2010c:118,120). Typical human factors related to human communication would include: attitude (towards the situation, self, content of the message and the sender); respect (for people and acceptance of fair criticism); politeness, loyalty (do not misuse information or breach trust) (Huebsch, 1995:11).

A few studies have been carried out where humans in organisational communication have effectively communicated the EA message (Kirkhaug, 2010:23; Robles, 2012:453; Von Groddeck, 2011:69; Windsor, 2013). Elements of communication referenced in these studies include: the value that different people attached to communication; sharing of organisational values between peers and not necessarily between superiors and workers; and generation of trust when communication is good. Von Groddeck (2011:69) distinguishes between three situations where organisations would use values in communication to stakeholders. According to Von Groddeck (2011:69), value is attached to types of semantic communication in organisations when communication is addressed to different groups in a complex situation or when the sender is unsure which stakeholders should receive the specific information; when the identity of the organisation asks for more than just factual information and value descriptions are attached to the relevant information; when it is difficult to describe strategic plans and decisions quantitatively and value-driven communication is required.

A study by Kirkhaug (2010:30) showed that perceptions about the values of an organisation shared between stakeholders and colleagues led to better communication. The study revealed that communication was perceived more favourable when information was shared between colleagues rather than shared between leaders and workers.

Windsor (2013) lists five factors that are changing organisational communication by management today: greater complexity, empowered stakeholders, the network effect, constancy of change, and the erosion of governance. Enterprises are globally visible and deal with huge volumes of data and information, which forces them to deal with complexity. Stakeholders have become interactive participants in enterprise decisions. Internal and external networking leads to dynamic teamwork. Networking needs to be managed well to create collaboration and ensure a strong enterprise team. Continuous communication of enterprise values in fast-changing situations constitutes human assurance of job security, working roles and relationships. Governance alone is not a sufficient corporate driver. Effective communication generates trust.

5.3.1.2 Cooperation

According to the Oxford paperback dictionary, cooperation means *owned and run jointly by* (OPD, 1979:770). Successful organisations rely on the cooperation of individual workers and teams. Time is saved and productivity increases if individual workers help each other with tasks, share information and skills and communicate well (Kosfeld *et al.*, 2011:24). Cooperation in organisations happens when people work together on projects in a joint effort and usually in a controlled environment. Elements of human cooperation important in an organisational team context are interaction, involvement, participation, communication, shared vision and agreement to share knowledge. People participate in a teamwork effort to achieve a mutually shared goal (sections 2.4.2 and 3.2.3). Although the terms "cooperation" and "collaboration" are both used to describe effective teamwork, there is on-going debate about the difference between the two terms (Lam, 1997:973; Lojeski *et al.*, 2006:25c; Stoner, 2013). Collaboration happens when more than what is expected from individuals is being done in a teamwork effort. The result is that something new, which may be the result of innovation or creativeness, is produced (Stoner, 2013). Collaboration is discussed in Section 5.3.1.4.

The following studies explain some human factors that have been found to impact on cooperation in organisational contexts.

In a study by Kosfeld and von Siemens (2011:24) the authors differentiate between *selfish* and *conditionally cooperative* workers. Selfish workers would only participate in coordinated work if remuneration is high but do not relate to cooperation as a joint effort. Although remuneration may be important to conditionally cooperative workers, they are also intrinsically motivated towards cooperation and will share skills and information and provide support to fellow workers or team members on condition that others cooperate. Kosfeld and von Siemens (2011:24) state that although cooperation between workers is mostly beneficial to the organisation, it is often a sacrifice made by an individual with relation to time and effort.

Trust in leadership and workgroup solidarity can lead to better cooperation of employees in organisational tasks. In a study by Loh *et al*. (2010:2948) cooperation and trust of different social groups have been investigated. The influence of workgroup membership, culture and organisational status in the workplace were considered. It was found that workgroup membership was a key determinant of trust and cooperation and members of a workgroup trusted colleagues of higher organisational status more and cooperated more with them In this study culture groups did not seem to influence trust and cooperation. In a study by Eckel *et al*. (2010:759) the status of a leader proved to be a determining factor of a role model.

Michel *et al*. (2010:44) investigated the impact of procedural justice on employee identification with their organisations in times of change. The theory of the group engagement model of Tyler and Blader (cited by Michel *et al*. (2010:54)) where procedural justice is linked to organisational cooperation is used to develop a model showing the positive relationship between procedural justice and commitment to change, values-congruent fit and change-supporting behaviour. In this study it was suggested that employees who identify with organisational norms and values and who understand the reasons for new procedures and new ways of work are more supportive of and committed to deal with organisational change processes (Michel *et al.*, 2010:54).

The concept of cooperation in EA in organisations implies that EA be owned and run by all stakeholders (Schekkerman, 2004c:26). Cooperation and shared ownership are non-contractible, difficult to measure, human-related factors that remain a challenge for people responsible for the business of an organisation and people responsible for the maintenance and preservation of an organisation's IM and IT (Section 2.6.1). Hoogervorst (2009:56, 73, 105) explain that people "shape" an enterprise but that, at the same time, the working environment of an enterprise also "shape" its people. When personal goals and work motivations of stakeholders are aligned with enterprise objectives and operations, enterprise performance and productivity are satisfactory and likely to increase (Hoogervorst, 2009:70).

5.3.1.3 Coordination

Coordination is defined as *to bring parts into a proper relationship* or *to work or cause to work together efficiently* (OPD, 1979:770). Coordination of elements or processes in EA and understanding and management of relationships between human elements in organisations can be achieved only if EA is accepted by all humans involved. Koontz *et al*. (1980:81) define coordination as *achieving harmony of individual effort with group effort toward the accomplishment of group purposes and objectives*. Coordination is defined in Collins dictionary (Collins Concise Dictionary, 2004) as *to integrate (diverse elements) in a harmonious operation* or *work together harmoniously*. Roberts (2011:677) defines "coordination" as the synchronising of system elements to forge a coherent, integrated whole and explains that coordination should be a purposeful and planned act. Coordination takes time, effort and attention.

Hoogervorst (2009:194) explains that relationships between humans in an organisation are mostly driven by information and a result of information exchange. According to Hoogervorst (2009:194), coordination in IT governance means that activities need to be "mutually synchronised to avoid the overlap or absence of tasks". Acceptance and implementation of EA in organisations are diffuse actions happening continuously over time and in complex process handling. It is necessary that humans of all work roles accept responsibility to ensure effective and mutual coordination of planning, tasks and work processes. Elements of coordination important in EA are mutual communication and shared meaning, responsibility to communicate, act and share when expected to in task planning and execution and commitment to cooperate.

The following three examples show relationships between human factors and coordination. All of the human factors mentioned below would also affect coordination of EA tasks and processes.

Koontz *et al*. (1980:82) explain that in group efforts, people often interpret similar ideas differently and propose that managers or facilitators guide and coordinate differences in approach, timing, effort and interest to establish cooperation and pursuing of goals.

The process of coordination between people is illustrated by Dietz (2010:110) in Figure 5.7. A person initiating a coordination act with another person in a social environment shows commitment, expresses thought and passes on information. The partner in coordination or addressee perceives the given information, conceives the thought that evokes commitment and an act of coordination occurs. Physical data exchange leads to formative exchange of thought (significance), which then leads to informative exchange (understanding) and eventually agreed performance in an act of coordination.

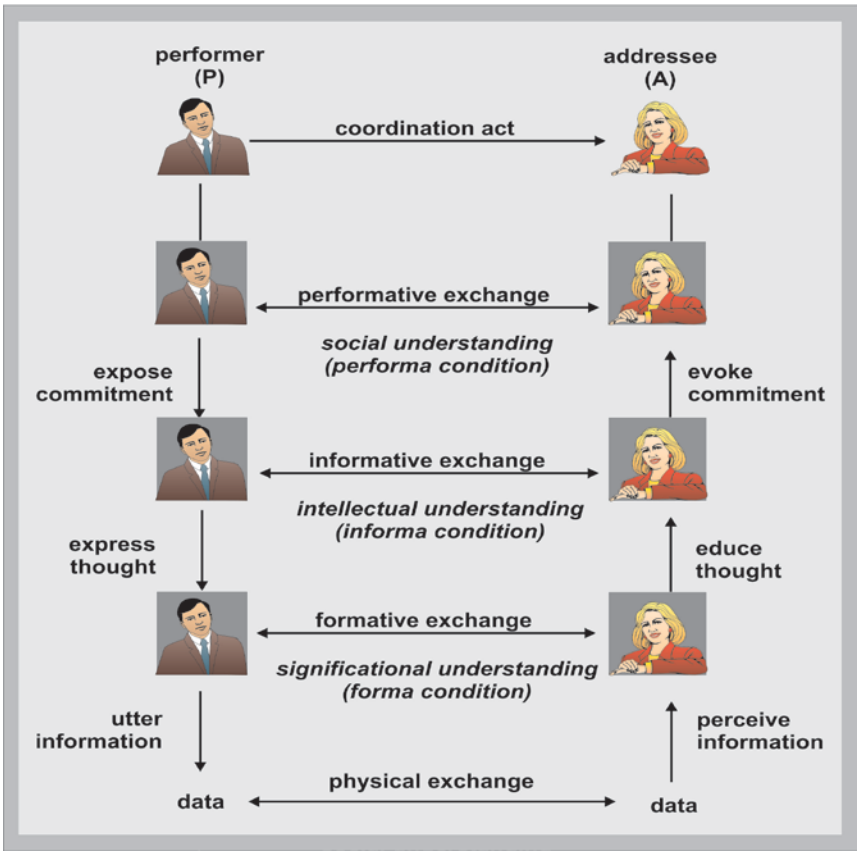


Figure 5.7: The process of performing a coordination act (Dietz, 2010:110)

Caldwell (2008:428) examines sharing and coordination of organisational information and knowledge and its impact on task productivity and information and communications technology (ICT) effectiveness in expert teams. In organisational management of complex engineering systems, stakeholder behaviour and socio-technical systems need to be coordinated to improve task-performance efficiency. Caldwell (2008:428) indicates three levels of feedback in ICT use when people share information and knowledge in normal and unusual event tasks: the effect of information and coordination loss on user acceptance; task impacts of ICT use on perceived task value; and the net value of ICT productivity influencing future ICT implementation decisions.

5.3.1.4 Collaboration

Collaboration means *to work in partnership* (OPD, 1979:770). Collaboration occurs when two or more people work together and share information to achieve a common goal (Carstens *et al.*, 2009:1227). Robbins (2004:428) and Covey (1989:274) describe collaboration in conflict situations and state that parties have intentions of cooperation and mutually beneficial outcomes and therefore accept each other's viewpoints and clarify differences in order to establish a win-win situation. Denise (2004:3) explains that the aim of a collaborative effort is to create something new and that collaboration is "not anchored in the process of relationship but in the pursuit of a specific result". For the purpose of my research, collaboration is comprehended and described as human behaviour that goes beyond the normal call of duty for cooperation (joint effort) in organisational tasks. Human traits of shared understanding, creative use of information,

innovative solutions, creative compliance, self-management and utilisation of differences come to mind when collaboration on work projects and tasks are described. There is however another connotation of the word “collaboration”.

Denise (2004) explains that collaboration means that information is used to create shared meaning and understanding, and that in contrast to the general belief that one needs to have cooperation and coordination to achieve collaboration it is divergence, differences and spontaneity found in interpersonal connections that lead to results. This is confirmed by Covey (1989:283) when he states that *valuing differences in people is the essence of synergy* and synergy is possible in an interdependent reality with other human beings. Robbins (2004:428) explains collaboration as a mutually beneficial outcome for parties when they are trying to clarify a problem or situation, strike a win-win deal or intend to accommodate different points of view and clarify differences in seeking results or solutions that will satisfy all parties involved. Human action and human interaction are dynamic building blocks for a synergetic and growing organisational environment.

Martin and Eisenhardt (2010:265) define collaboration across different business units of an organisation as *collective activity* to create economic value. In their research, Martin and Eisenhardt (2010:295) analysed the collaborative effect of business unit management in business processes and compared the outcomes to the collaborative effect of corporate managed business processes. The study showed that collaboration is higher in business processes performed across business units when processes are business-unit-centric driven rather than corporate-centric controlled.

Laudon and Laudon (2011:82) illustrate how business organisations can benefit from people working together:

- Productivity increases and errors are less when people work in collaboration.
- Quality of work is higher when people work together, communicate about errors and make early corrections.
- People working together are more innovative and have more creative ideas.
- People working together solve problems with customers faster.
- Business organisations where people work in collaboration are more profitable and grow their businesses faster.

The following three examples of human factors affecting collaboration efforts in organisations relate to EA and my research.

Hoogervorst (2009:83) describe that different functional units in organisations work together to achieve joint goals and that tasks and processes need to be integrated through collaboration to achieve unity and coherence.

In a case study where coordination of organisations’ actions through use of information and communication technology (ICT) in disaster management were researched, it was found that personal trust was an essential human factor in collaborative actions (Saab *et al.*, 2013:205). According to Saab *et al.* (2013:198), collaboration means the sharing of authority and responsibility in planning solutions and solving problems.

Kolfschoten *et al*. (2012:130) investigated the use of collaboration technologies in organisations such as group support systems (software tools) in work processes. They distinguished between technical and process tasks. Design, application and management tasks of facilitators were investigated in both technical and process group tasks. The researchers focused on facilitators' skills, personality traits and task-related knowledge. Most of the human factors affecting facilitation were found in the process tasks. Skills mentioned included group dynamic skills, listening skills, social skills, leadership skills and communication skills. Personality- or behaviour-related task elements included human factors such as goal focused, discipline, self-confidence, honesty, flexibility, creativity, patience and communication.

5.3.1.5 Commitment

Commitment is defined in the Oxford paperback dictionary (OPD, 1979:160) as *the state of being involved in an obligation* or to *perform an obligation*. Commitment is not only willingness and intention to cooperate but it is in realisation, physical action or performance that commitment becomes a reality. Covey (1989:306) explains that for humans to grow personally and in relationships, it is essential to *learn*, *commit* and *do* in an upward spiral (Figure 5.8). Working in an organisation requires from humans as individuals to work as part of a team. As individuals or in teamwork they have to learn, commit and do to grow – not only personally but also as an obligation to sustain or help improve the dynamic working organisation. Organisations set goals to achieve objectives and when employees are viewed as stakeholders, they are considered as individuals with defined purposes and ideas. People are encouraged to commit and take responsibility for their own work performances (Koontz *et al.*, 1980:208).

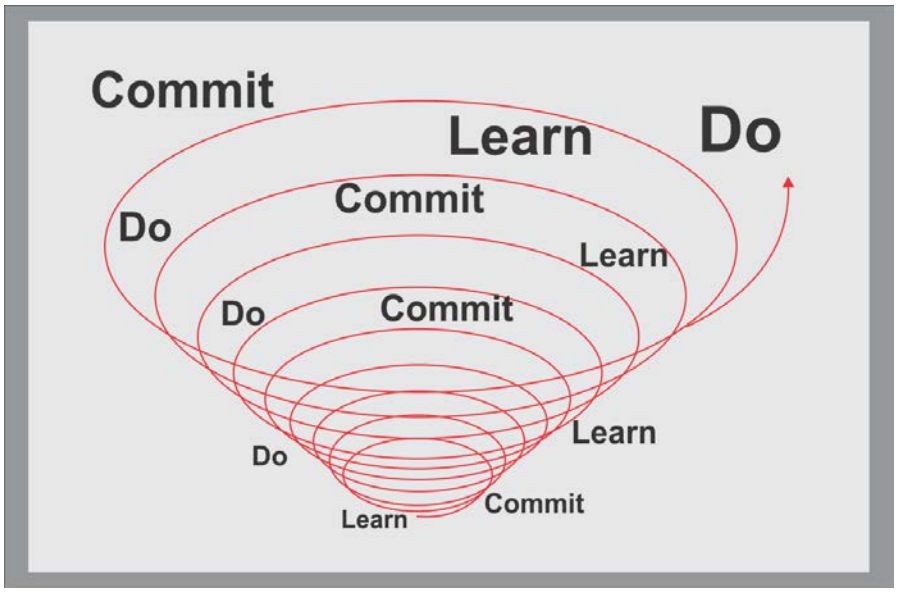


Figure 5.8: The upward spiral (Covey, 1989:306)

The human factors of attitude, self-discipline, self-management, trust and honesty are examples of human commitment in organisations. The following examples illustrate elements of commitment related to EA and my research.

Organisational management, making decisions to adopt new strategies such as EA, needs to consider what Koontz *et al*. (1980:179) describe as the *commitment principle*. This principle explains that time needs to pass before the impact of commitments made through logical planning become clear. It is therefore important to plan for the future impact of today's decisions. Hoogervorst (2009:194) explains collaboration in IT related tasks and projects of organisations by saying that objectives can only be reached effectively in the case of a joint human effort.

A study by Fritz *et al*. (2013:251) shows that employee behaviour, employee attitude and employee commitment are positively influenced by managers who live up to their expectations of supervisory behavioural integrity and organisational commitment.

Adopting and introducing EA as a strategy in organisations bring about change in the perceptions and handling of organisational processes. In a study relevant to my research, Santhidran *et al*. (2013:350) show that it is important for organisational leaders to prepare and support employees in understanding intended organisational change. Change readiness in organisations is necessary before commitment to change will happen and leaders' communication, trustworthiness, sincerity, honesty and own commitment are factors fostering employee acceptance and commitment to accept change.

5.3.1.6 Connotation

The Oxford paperback dictionary defines connotation as *to imply in addition to the literal meaning* (OPD, 1979:770). Collins dictionary (Collins Concise Dictionary, 2004) defines connotation as *an association or idea suggested by a word or a phrase*. The word "connotation" refers to the human judgement of value or experienced feeling associated with a particular word or phrase. The literal meaning of a word or a phrase describing an object defines that object. Depending on the context of the use of words and phrases, people add meaning or association or value or feelings. Words can also have different meaning in different cultures. Words or phrases may be perceived literally but often people attach additional meaning to words or phrases depending on factors such as how they perceive the sender of the message, their own feelings, their previous positive or negative association with a word or phrase or not completely understanding the message conveyed to them. Lawton (2011:136) differentiates between denotation which refers to a word's literal meaning and connotation where emotions are involved in words.

Connotation or meaning can change depending on how humans make sense of reality in context. Cunningham (1992:185) explains how humans use cognition in a cyclic manner to make sense of reality. Ideas or understanding are generated through experience (induction). More or other ideas may be deduced from existing ideas but through a process of abduction, humans make sense of new phenomenon. According to Cunningham (1992:185), reality does not change, but human belief of reality can change through abduction when a new belief is set or an old belief is revised.

Typical human factors related to connotation of terminology and words are the expression of meaning in communication, mutual acceptance of meaning by people and universal use of concepts and terms.

The following examples show how connotation can impact on the complex environment of an organisation. Acceptance of EA has been influenced by connotation as described by Kappelman and Ross (2010:1, 12):

"enterprise architecture has long been the concept that dared not speak its name"; and "please don't use the word *architecture*…it's a bad word here".

In their study on how socio-technical activities of sensitisation, awareness and constructive engagement can be incorporated into SE, Baxter and Sommerville (2011:11) show that inconsistent use of the term "socio-technical" and the connotation people attach to the term affect understanding and development of complex systems.

Khan *et al*. (2012:22) investigate the impact of performance, motivation, organisational environment, managerial expertise and organisational culture on organisational effectiveness. The additional meaning attached to or the connotation of the concept 'organisational effectiveness' is discussed. The goal model of organisational effectiveness describes organisational effectiveness in terms of reaching organisational goals and objectives through utilisation of resources. Depending on who uses the concept, its meaning is adjusted. According to Khan *et al*. (2012:22), the term "organisational effectiveness" is used by researchers, managers, and different organisational groups. Different stakeholders have different ideas of what "organisational effectiveness" means depending on their interest in organisations.

Connotations attached to the word "architecture" have moved from a reference to buildings to, in the technology era, the physical technology in IT. This may be part of the reason why the concept of "enterprise architecture" is often misinterpreted. Zachman (2012), however, makes it clear that just as architecture was a key to the industrial era to handle complexity of buildings and change so will EA in future be proven to have been a key to the information era in handling complexity and change of enterprises. According to Hoogervorst (2009:128), the concept of "architecture" is used in a descriptive and prescriptive way: the descriptive reference is that of a plan, a blueprint or an organisation; the prescriptive and normative way is concerned with design knowledge and principles such as in EA and EE.

5.3.1.7 Human Concerns used in Combination

The individual EAHCs, described above in sections 5.3.1.1 to 5.3.1.6 often appear in combination, depending on the situation and context of an organisation. It is sometimes difficult to make an exact distinction between the different concerns identified for the research and one concern can be embedded into another concern as is the case in Figure 5.7 where someone has to commit to participate in a coordinated task. Therefore, depending on the context in which the human factors are identified, it would also be possible for one human factor to be categorised into more than one human concern (Table 5.13).

Two examples show how some of the abovementioned EAHCs have been combined in research. In the first example, connotation and collaboration influence integration of business and IT architecture.

Chen *et al*. (2008:657) state:

> *Past and recent developments show that there are two main research communities active in developing enterprise architectures from two different perspectives: IT and enterprise modelling.*

According to Chen *et al*. (2008:657), the main reasons given for the different perspectives are the different meanings that people attach to concepts and people not speaking the same language. Collaboration of business architecture and IT architecture to work towards integration and the use of an agreed on language of architecture representation should be expedited.

In a second example, a study on the effect of organisational power and politics in management-information-system implementation shows how coordination and communication affect acceptance of new technologies. Markus (1983:431) states that implementation of new technologies can result in new work-role-related coordination and communication of responsibilities. Markus (1983:433) lists categories of factors internal to individuals and human groups that cause resistance to IS as: cognitive style, personality traits and human nature. System-determined factors that result in resistance are lack of user friendliness, poor human factors and inadequate technical design or implementation. Markus (1983:433) elaborates on underlying assumptions of theories of resistance by considering interaction between systems and humans. Possible socio-technical and political variants are assumed and listed for information systems, organisations and resistance (Table 5.12).

Table 5.12: Underlying assumptions of interaction theory (Markus, 1983:433)

CAUSE OF RESISTANCE	SOCIO-TECHNICAL VARIANT	POLITICAL VARIANT
Factors (human and system)	Interaction of system with division of work	Interaction of system with intra-organisational power distribution
Assumptions about IS	Systems may have the purpose to change organisational culture and not only workflow	Systems may be intended to change the balance of power
Assumptions about organisations	Goals conditioned by history	Goals differ by organisational location; endemic conflict
Assumptions about resistance	Resistance is a product of the setting, users, and designers; neither desirable or undesirable	

Robles (2012:455) lists ten soft skill attributes needed for stakeholders and employees in organisations identified in a survey amongst executive leaders: communication, courtesy, flexibility, integrity, interpersonal skills such as patience and self-control, positive attitude, responsibility, professionalism, teamwork and work ethic.

In a presentation by Bonnet (2009) on occupational assessments, it was explained that capability- and personality profiles of different professions can assist organisations in appointment and retaining of the right people for the right work. Certain people are comfortable doing certain types of work and specific attributes (human factors) are needed for types work. For example, essential human factors for a business analyst would be: likes to work with numbers; critically evaluates information. Important human factors would include: concerned about details; able to change behaviour according to the situation; seeks for change and variety in work; innovative, interested in theories; comfortable when meeting new people; follows own approach; expresses own opinion; enjoys negotiating. Other relevant human factors would include: analysing

behaviour of other people; taking control; involving other people in decision making; long-term thinking and planning; conscientiously finishing work; generally calm and relaxed.

5.3.1.8 EA Related Human Factors mapped into Human Concerns

Each human factor was analysed and considered for categorisation before the integrated list of human factors identified from the exploratory study and literature were mapped into the identified EAHCs categories. Table 5.13 shows the mapping of EA-related human factors impacting on EA acceptance into six EAHCs.

Table 5.13: Human factors mapped into six human concerns

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
Communication	Interact with all stakeholders, address their needs and share motives, problems and small victories
	Communication: request early and continuous updates of EA tasks and results
	Acknowledge human input and effort
	Realistic expectations - continuously share benefits and results of EA
	Share knowledge with architects
	Understand and deal with global issues
	Open-minded and accept input and innovative ideas from stakeholders
	Explain perceived benefits and competitive advantages of EA
	Communication skills for all EA stakeholders – accurate reflection of intentions, allow information flow and allow decisions to filter through
	Architects and managers should act as mediators between business leaders and workers and use advisory skills
	Identify reusable information
	Understanding business, IM and IT requirements AND stakeholder concerns
	Enable information exchange and preservation
	Share some knowledge and skills but all information
	Interaction and social networking
Cooperation	Stakeholder involvement, cooperation and understanding of EA initiatives
	Understand benefits and competitive advantage - perceived usefulness of EA
	Personal and organisational (group) dynamics
	Realistic expectations
	Acknowledge maturity level differences
	All stakeholders should be open-minded to accept EA initiatives and perform EA tasks
	Management and architects should do continuous validity checking
	All stakeholders should accept and provide training if needed
	Leadership and teamwork skills are needed across different work levels
	Information sharing
	Acknowledge and understand EA initiatives (business, IM and IT integration viewpoint)
	Demonstrate support for EA initiatives (accept and provide)
Coordination	Understand long-term ROI of EA
	Understand and share long term vision
	Acknowledge human input and effort
	Follow ‘as-is’ and ‘to-be’ roadmap
	Optimise and standardise – procedures, equipment and services
	Stakeholders should facilitate / understand transformation and change
	Coordinate diversity and change

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Think analytically, implement practically
	Adapt and adjust EA initiatives when needed
	Understand balance between needs, quality of work and expenditure on resources
Collaboration	Facilitate and manage transformation and culture change – engineering
	Promote a business and technology human inclusive view
	Risk management and financing - remuneration of effort expectation
	Collaborate: Decision making by management should reflect in execution of EA tasks by stakeholders or teams
	Stakeholders across work levels should be involvement in EA initiative
	Architects should perform EA guidance rather than governance - governance performed by business and IT management
	Provide for EA knowledge sharing and EA training
	Solutions architecture with a purpose – based on design objectives
	Create collaboration opportunities and educate employees
	Optimise and standardise – procedures, equipment and services
	Reasonable requests for resources
	Accept authority and shared values
	Retain and reuse of information resources
	Promote stakeholder self-efficiency and work efficacy in EA initiatives
	EA stakeholder team dynamics (involvement) cultivate creativity and synergy
Commitment	Business leaders should accept ownership of business, IM and IT alignment
	Managers should show proof of personal strength and leadership skills
	Managers should show continuous adaptation (short term) and conformation of EA process (long term)
	Management should have patience with EA initiatives
	Managers should be people with integrity, be honest and adhere to ethical behaviour
	Managers and architects need to show perseverance in EA initiatives
	Architects need professional EA skills
	Stakeholders have to understand enterprise culture, vision and principles
	Stakeholders should be prepared to accept the EA challenge
	Management and architects should foster stakeholder engagement into EA
	Architects need to be dedicated to the EA initiative
	Architects and managers should be able to resolve conflict
	Stakeholders and users should accept responsibility and accountability for EA tasks
	Group/organisation affiliation and dynamics needed for EA initiatives
	Different behaviour characteristics needed for different work levels to show support for EA initiatives: technicians and workers need to show trust, patience, loyalty, participation, engagement, honesty and focus on enterprise business priorities
	Positive attitude is needed for EA initiative
	Work satisfaction of technicians and workers – understand the balance between needs, quality of work and expenditure
	Stakeholders need to show a passion for EA - stay focused
	Accept organisational culture change
Connotation	Use a commonly understood business and EA language
	Define and understand EA concepts
	Conceptualise
	Understand EA metamodels
	Establish future architecture vision and definition

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Facilitate architectural modelling and implementation
	Understand work role importance
	Subjective norm

5.4 WORK LEVELS APPLICABLE TO ENTERPRISE ARCHITECTURE

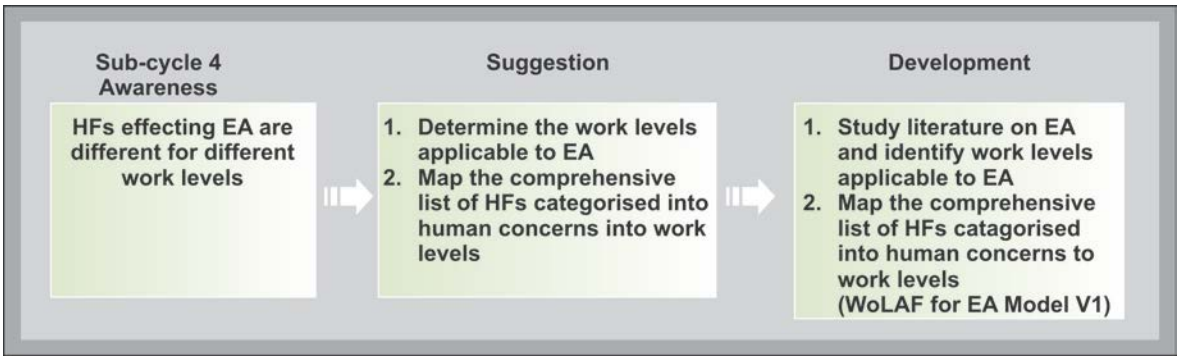


Figure 5.9: Design research Sub-cycle 4

SO1.2, to determine the work levels applicable to EA, involved two action steps:

- Design research Sub-cycle 4(1) involved a literature study to identify the work levels applicable to EA.
- Design research Sub-cycle 4(2) mapped the human factors classified into human concerns to these identified work levels for EA.

The development phase of design research Sub-cycle 4(1) is discussed in sections 5.4.1 to 5.4.4. The development phase of design research Sub-cycle 4(2) is discussed in Section 5.5 (Figure 5.9).

5.4.1 Background

I attended several EARF meetings (EARF, 2009) where EA as an organisational strategy was discussed by members and EA practitioners, and the human role affecting EA acceptance was highlighted on several occasions. I then realised that there was a need to determine the human factors responsible for affecting EA acceptance in enterprises. During the interviews that were part of the exploratory study, the influence different work levels had on responses, was noticed. Responses from individual and focus group participants showed that human factors impacting on EA decisions and work processes were different for different work levels.

5.4.2 Interviews

The first participant interviewed in the preamble to the exploratory study to identify human factors that affect EA acceptance was a business and EA consultant. At the time, the consultant was assisting an enterprise and one of its sub-organisations in the management of its business, IM and IT integration processes (supported by EA). On recommendation of the consultant, the enterprise manager responsible for change management and EA positioning in the particular organisation was interviewed. During the interview with the manager, other participants were recommended and a focus group interview was organised (sections 4.6.2 and 4.6.5). Four of the focus group participants represented members from an EA team working together at one sub-organisation of the enterprise and one participant was a section representative from the same sub-organisation as the first manager. The focus group participants were mostly people that have worked in an IT environment, completed some EA training and were now part of a team that was responsible for the business, IT and IM integration process. Already in the course of the first interview and the subsequent focus group interview, it was realised that human factors affecting EA acceptance were different for different work levels defined in the enterprise and sub-organisation. In snowball sampling, participants are recommended by others and the interviewer does not always have control over choice of participants as was the case in this exploratory study. Interviews were also conducted with three other participants who were not members of the sub-organisational EA team or directly involved in the EA initiative of the enterprise. One participant was a business production engineer, one participant was a technician involved in local- and global IT systems integration and maintenance and one participant was a human resources manager who was part of the IM and technical team supporting the organisational EA initiative.

Participants representing different work levels had different views of the EA initiative of the organisation. For example from a management perspective level it was important that all resources (from finances to roles of people to operations and technology) are used to ensure that the EA initiative adds value to the global enterprise. From a technicians and worker level perspective, the EA initiative was viewed from the one instance where it was successfully implemented in one sub-organisation of the enterprise (a local view). Some of the responses that highlight the different human factors for different work levels are listed in Table 5.14.

Table 5.14: Participant responses on work levels

PARTICIPANT	RESPONSES
Manager	• At strategic level, business strategy and objectives are set. EA is accepted as long as it adds value. • At management level, acceptance of EA is important. If people do not understand the language, grasp the practical benefits and see regular progress and results, they do not accept the "new" direction. • It is very important that stakeholders understand the motives and the essence of the EA operation. • Managers and architects should share small victories with stakeholders and show the road.

Manager (human resources)	• Business consultants representing business units are concerned with business plans. • The build phase normally involves a team consisting of various stakeholders defined by diverse roles. Roles vary and include IT and IM defined, engineering, technical, financial, administrative, quality control, and managerial. It is here where non-technical, human factors affect cooperation and coordination.
Technician	• Technical people find it difficult to relate to business architecture when their main concern is solutions architecture. • Change management is the important component responsible for the alignment of information management and business principles. • Business analysts, project managers and IT managers make decisions and appoint people to take responsibility and do the work.
Manager (production)	• Three teams involved – business unit, project team and IM/IT solutions team. The business unit should take ownership.
Enterprise architecture team	• Users, stakeholders and information management technicians were guided in a step-wise process over time to cooperate in new ways of information management and reporting. • Management should take ownership of EA. • Culture of sub-organisations differs. • Accepting of responsibility is work-role related. • Understanding the concept of EA and its confusion with IT architecture. • Establishing of work-role responsibility and EA involvement.

5.4.3 Human Roles and Work Levels

The EA literature was consulted to identify possible human roles and work levels. Many authors recognise the importance of human roles and work levels in EA. For example, the importance of strategic grouping is discussed by Nadler and Tushman (1997:77). According to Zacarias *et al.* (2007:842), roles define behaviour of people in specific interaction contexts and people can perform more than one role. Enterprise architecture management was discussed in Section 2.6.2. Ross *et al*. (2006:101) discuss how management practices can gain organisational value from EA with reference to the different stages of business silos, standardised technology, optimised core and business modularity. These management practices include roles and managerial processes. Ross *et al.*(2006:103) show which managers together with architects are involved at the different EA stages and processes. During a first stage, project methodology and business cases are defined and no IT governance or change processes are involved. In a second stage, management practices include a group of IT executives, financial managers responsible for EA- and technology budgets, enterprise architects and technical experts to ensure that technology standards are met and adjusted if necessary. Understanding the need for EA (integration of business processes and technology standards) and the resulting organisational change characterise the third stage where process owners, enterprise architects, business leaders, project managers, senior executives and IT managers are involved. During the fourth stage,

management practices focus on organisational communication of how IT support business practices and the long-term vision of IT, IM and business integration (Ross *et al.*, 2006:104).

TOGAF (2009:36) describes roles of people in organisations as functional and states that people make contributions of knowledge, skills, experience and abilities through their work roles. TOGAF (2009:672) outlines basic principles of governance in specific organisational domains: corporate-, technology-, IT- and architecture domains (Section 2.5.2). For example, at corporate level the focus is on effective business guidance, stakeholder management and overseeing correct usage of resources to ensure sustainability of organisational objectives. Technology governance is becoming more and more important as organisations rely on IT for most operations and information management. Architecture governance include planning, development and monitoring of all EA practices to support business management, ensure that standards are met and that stakeholders' expectations are addressed (TOGAF, 2009:672). The role of the enterprise architect is the only work role describes in detail by TOGAF (2009:700).

GERAM (1999:8) states that enterprise models should describe human roles and human capabilities, and how human roles are organised and coordinated to interact and operate with other humans and technology in execution of business operations. According to GERAM (1999:9), roles of individuals and groups of humans and the coordination of work roles form an integral part of the successful business operations of an organisation. Humans and groups can have more than one role at the same time and roles can change. Knowledge of work roles and how to best coordinate these work roles are perceived as an enterprise asset (GERAM, 1999).

The different work levels in EA as described by The Zachman Framework for Enterprise Architecture (Zachman, 2011a) were found to be a guideline and way of classifying human factors identified in the research (sections 2.5.1 and 5.2.2.5).

The Zachman Enterprise Framework $^{2\,TM}$ (Zachman, 2006; Zachman, 2008a), The Zachman Framework for Enterprise Architecture (Zachman, 2011a) and Zachman's descriptions (Zachman, 2010c) of work levels (column 1, Figure 5.10), work for allocated roles (column 2, Figure 5.10) and group accountability in the organisation (column 3, Figure 5.10) were the closest match of work levels, roles and responsibilities found in EA literature that corresponded to my experience with participants interviewed and were therefore taken as a useful reference and guideline of possible EA audience work level categories for my research.

Zachman (2006) stresses that perspectives are not organisational structures or phases of application development projects. The owner (business role), designer (system role) and builder perspectives of rows 2, 3 and 4 (Figure 5.10) are seen as principle audience perspectives. The executive and technician audience perspectives of row 1 and 5 represent the business vision and planning in context and the implementation responsibilities, respectively (Zachman, 2006). Zachman (2010c:135) describes the role of the owner, designer and builder in the EA initiative of an organisation:

- The role of the owner is focused on intentions, decisions, and objectives for EA organisational integration. Cooperation and information sharing with architects form part of the owner's role. EA ownership encompasses the 'to-be' intentions for the organisation and overseeing that architecture plans and the actual processes are realised and implemented.

- The role of the architect or designer is to define and manage EA governance in an organisation. Architect tasks include the analytical definition of EA, setting boundaries for EA for the specific enterprise, deciding which models to include and build, and overseeing and maintaining the EA initiative of an enterprise. The enterprise architect fulfils an advisory and supervisory EA role.
- The role of the builder is to ensure that all technology and modelling resources specified and required for the EA initiative are made available to technicians and workers. The builder assesses EA work and make sure that implementations reflect business intentions and objectives.

EA is a continuous process and maintenance is important for all work levels and roles to reflect a true picture of the enterprise when change happens over time (Zachman, 2010c:137).

After reviewing the exploratory study's responses (Table 5.5) and using The Zachman Framework for Enterprise Architecture's "Who" abstraction and descriptions of the "Audience Perspectives" (Section 2.5.1, Figure 2.2, Figure 5.10) as a point of reference, four EA audience work levels for the research was defined (Table 5.15).

Who	Roles Allocated Work Managed	Organisation Performance Group Accountability
Strategists (thought leaders) as theorists	Scope, vision, identify, plan in context	Overall high level abstraction
Executive leaders as owners	Business definition, decision, concepts language	High level abstraction
Architect (methodologists) as designers	Understand business logic and physical and technical implementation	High level abstraction
Engineers (technologists) as builders	Physical specifications	Technology/ business abstraction
Technicians (specialists) as implementers	Assemble, configure	Technology/ abstraction
Workers (professionals) as participants	Instantiate, do work	Operations abstraction

Figure 5.10: The Zachman Framework for Enterprise Architecture Audience Perspectives

Table 5.15: Work levels derived from The Zachman Framework for Enterprise Architecture

AUDIENCE PERSPECTIVES (THE ZACHMAN FRAMEWORK FOR ENTERPRISE ARCHITECTURE)	EA AUDIENCE WORK LEVELS DERIVED
Executive perspective Business context (planners)	Executive / Manager
Business management perspective Business concepts (owners)	
Architect perspective Business logic (designers)	Architect
Engineer perspective Business physics (builders)	Analyst / Engineer
Technician perspective Business component (implementers)	
Enterprise perspective (users)	Technician / Worker

5.5 WOLAF FOR EA MODEL V1: MAPPING HUMAN FACTORS INTO WORK LEVELS

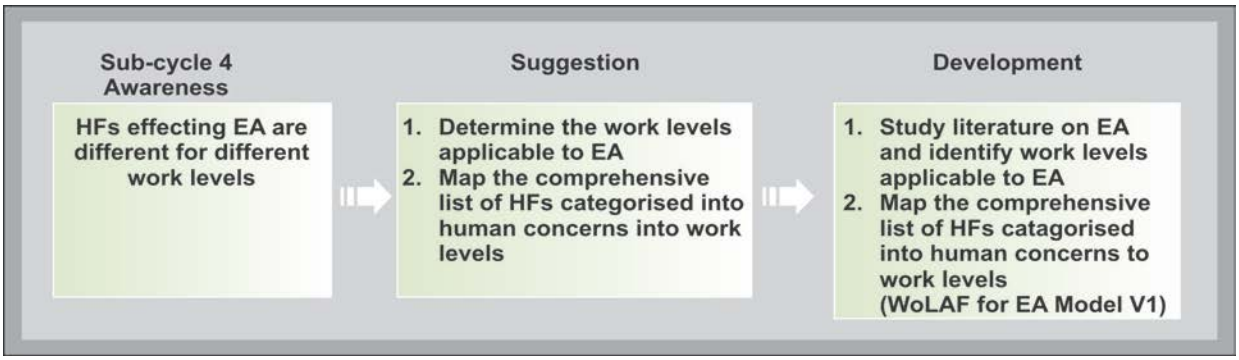


Figure 5.11: Design research Sub-cycle 4

Design research Sub-cycle 4(2) mapped the human factors classified into human concerns (Section 5.3.1.8) to the identified work levels for EA described in Section 5.4.

The comprehensive, combined list of human factors identified and categorised into six human concerns (Table 5.12) was mapped to the work levels of executive/manager (see section 5.5.1), architect (see section 5.5.2), analyst/engineer (see section 5.5.3) and technician/worker (see section 5.5.4). The outcome of this mapping is labelled *Work Level Acceptance Framework for EA Model Version 1* (WoLAF for EA Model V1).

5.5.1 Executive/Manager Level

Executive leaders control the business scope and vision of enterprises and although they usually approve the budget for EA, they are not directly involved in EA initiatives. Managers from different sectors in an enterprise contribute to EA initiatives for example business managers, risk managers, financial managers, IM managers, IT managers, project managers, etc. The EA work of a manager forms part of other organisational work and responsibilities. Managers of business units should take ownership of business projects and EA integration. IM and IT managers accept responsibility for IM and IT support services for business projects and processes. Managers should commit themselves to continuous communication and feedback to make sure that not only business, IM and IT needs are communicated, understood and addressed but also that successful EA integration and implementation are shared.

After critical analysis of each human factor (Table 5.11) and revisiting of exploratory responses, key words, phrases and information from the exploratory interviews were used to classify human factors at executive/manager level. Examples of key words, phrases and responses from interviews are highlighted using italics in Table 5.16.

Table 5.16: Human factors for executive/manager level mapped into human concerns

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
Communication	*Interact with all stakeholders, address their needs and share motives, problems and small victories*
	Share knowledge with architects
	Acknowledge human input and effort
	Realistic expectations - continuously share benefits and results of EA
	Communication: request early and continuous updates of EA tasks and results
	Understand and deal with global issues
	Accept input and innovative ideas from stakeholders
	Explain perceived benefits and competitive advantages of EA
	Communication skills for all EA stakeholders – accurate reflection of intentions, allow information flow and allow decisions to filter through
	Architects and managers should act as mediators between business leaders and workers and use advisory skills
	Identify reusable information
	Understanding business, IM and IT requirements AND stakeholder concerns
	Enable information exchange and preservation
	Share some knowledge and skills but all information
	Interaction and social networking
Cooperation	Stakeholder involvement, cooperation and understanding of EA initiatives
	Understand benefits and competitive advantage - perceived usefulness of EA
	Personal and organisational (group) dynamics
	Realistic expectations
	Acknowledge maturity level differences
	All stakeholders should be open-minded to accept EA initiatives and perform EA tasks
	Management and architects should do continuous EA validity checking
	All stakeholders should accept and provide training if needed
	Leadership and teamwork skills are needed across different work levels

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Information sharing
	Acknowledge and understand EA initiatives (business, IM and IT integration viewpoint)
	Demonstrate support for EA initiatives (accept and provide)
Coordination	*Understand long-term ROI of EA*
	Understand and share long term vision
	Acknowledge human input and effort
	Follow 'as-is' and 'to-be' roadmap
	Optimise and standardise – procedures, equipment and services
	Stakeholders should facilitate / understand transformation and change
	Coordinate diversity and manage change
	Think analytically, implement practically
	Adapt and adjust EA initiatives when needed
	Understand balance between needs, quality of work and expenditure on resources
Collaboration	*Facilitate and manage transformation and culture change – engineering*
	Promote a business and technology human inclusive view
	Risk management and financing - remuneration of effort expectation
	Collaborate: *Decision making by management* should reflect in execution of EA tasks by stakeholders or teams
	Stakeholders across work levels should be *involved in EA initiative*
	Architects should perform EA guidance rather than governance - *governance performed by business and IT management*
	Provide for EA knowledge sharing and EA training
	Solutions architecture with a purpose – based on design objectives
	Create collaboration opportunities and educate employees
	Optimise and standardise – procedures, equipment and services
	Reasonable requests for resources
	Accept authority and shared values
	Retain and reuse of information resources
	Promote stakeholder self-efficiency and work efficacy in EA initiatives
	EA stakeholder team dynamics (involvement) cultivate creativity and synergy
Commitment	*Business leaders should accept ownership of business, IM and IT alignment*
	Managers should show proof of personal strength and leadership skills
	Managers should show continuous adaptation (short term) and conformation of EA process (long term)
	Management should have patience with EA initiatives
	Managers and architects need to show perseverance in EA initiatives
	Managers should be people with integrity, be honest and adhere to ethical behaviour
	Architects need professional EA skills
	Stakeholders have to understand enterprise culture, vision and principles
	Stakeholders should be prepared to accept the EA challenge
	Management and architects should foster stakeholder engagement into EA
	Architects need to be dedicated to the EA initiative
	Architects and managers should be able to resolve conflict
	Stakeholders and users should accept responsibility and accountability for EA tasks
	Group/organisation affiliation and dynamics needed for EA initiatives
	Different behaviour characteristics needed for different work levels to show support for EA initiatives: technicians and workers need to show trust, patience, loyalty, participation, engagement, honesty and focus on enterprise business priorities

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Positive attitude is needed for EA initiative
	Work satisfaction of technicians and workers – understand the balance between needs, quality of work and expenditure
	Stakeholders need to show a passion for EA - stay focused
	Accept organisational culture change
Connotation	*Use a commonly understood business and EA language*
	Define and understand EA concepts
	Conceptualise
	Understand EA metamodels
	Establish future architecture vision and definition
	Facilitate architectural modelling and implementation
	Understand work role importance
	Subjective norm

Figure 5.12 represents a graphical summary of human factors affecting EA acceptance for executive and manager work roles.

Figure 5.12: Human factors for executive/manager

5.5.2 Architect Level

Enterprise architects are the designers of EA. Enterprise architects facilitate the EA initiatives of enterprises and act as mediators of EA initiatives between business management-, IM- and IT sectors of enterprises (Section 5.4.3). The complexity of an enterprise, its business strategy and the need for efficient and effective IM are the incentives for the adoption and acceptance of EA.

Enterprise architects understand enough of the business processes of organisations and the need for technology support to act as facilitators of EA when enterprises adopt EA as a strategy (TOGAF, 2009:700). The role of the architect was described in Section 5.2.2.5.2.

Lapalme (2012) distinguishes the human factors required by enterprise architects employed in the three different schools of thought (Section 5.2.2.4). For the enterprise architecting school, the enterprise architect needs to plan and design. In the enterprise integrating school, the enterprise architect has the role of inquirer and facilitator. In the enterprise ecological adaptation school, the enterprise architect needs to understand how to "make sense" and foster a transformation process where humans, their perceptions and organisational environment are vital role players in the enterprise architecture.

A holistic view and promotion of good relationships form part of a corporate enterprise architect's vision for an organisation and therefore of organisational design (Martin, 1995:28). Human factors (Table 5.11) were analysed and key words, phrases and information from the exploratory interviews were used to classify human factors at architect level. Examples of key words, phrases and responses from interviews are highlighted using italics in Table 5.17.

Table 5.17: Human factors for architect level mapped into human concerns

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
Communication	*Interact with all stakeholders, address their needs and share motives, problems and small victories*
	Communication: request early and continuous updates of EA tasks and results
	Acknowledge human input and effort
	Realistic expectations - continuously share benefits and results of EA
	Share knowledge with architects
	Understand and deal with global issues
	Open-minded and accept input and innovative ideas from stakeholders
	Explain perceived benefits and competitive advantages of EA
	Communication skills for all EA stakeholders – accurate reflection of intentions, allow information flow and allow decisions to filter through
	Architects and managers should act as mediators between business leaders and workers and use advisory skills
	Identify reusable information
	Understanding business, IM and IT requirements AND stakeholder concerns
	Enable information exchange and preservation
	Share some knowledge and skills but all information
	Interaction and social networking
Cooperation	Stakeholder involvement, cooperation and understanding of EA initiatives
	Understand benefits and competitive advantage - perceived usefulness of EA
	Personal and organisational (group) dynamics
	Realistic expectations
	Acknowledge maturity level differences
	All stakeholders should be open-minded to accept EA initiatives and perform EA tasks
	Management and architects should do continuous validity checking
	All stakeholders should accept and provide training if needed
	Leadership and teamwork skills are needed across different work levels
	Information sharing
	Acknowledge and understand EA initiatives (business, IM and IT integration viewpoint)
	Demonstrate support for EA initiatives (accept and provide)
Coordination	Understand long-term ROI of EA
	Understand and share long term vision

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Acknowledge human input and effort
	Follow 'as-is' and 'to-be' roadmap
	Optimise and standardise – procedures, equipment and services
	Stakeholders should facilitate / understand transformation and change
	Coordinate diversity and change
	Think analytically, implement practically
	Adapt and adjust EA initiatives when needed
	Understand balance between needs, quality of work and expenditure on resources
Collaboration	*Facilitate and manage transformation and culture change – engineering*
	Promote a business and technology human inclusive view
	Risk management and financing - remuneration of effort expectation
	Collaborate: Decision making by management should reflect in execution of EA tasks by stakeholders or teams
	Stakeholders across work levels should be involvement in EA initiative
	Architects should perform EA guidance rather than governance - governance performed by business and IT management
	Provide for EA knowledge sharing and EA training
	Solutions architecture with a purpose – based on design objectives
	Create collaboration opportunities and educate employees
	Optimise and standardise – procedures, equipment and services
	Reasonable requests for resources
	Accept authority and shared values
	Retain and reuse of information resources
	Promote stakeholder self-efficiency and work efficacy in EA initiatives
	EA stakeholder team dynamics (involvement) cultivate creativity and synergy
Commitment	Business leaders should accept ownership of business, IM and IT alignment
	Managers should show proof of personal strength and leadership skills
	Managers should show continuous adaptation (short term) and conformation of EA process (long term)
	Management should have patience with EA initiatives
	Managers should be people with integrity, be honest and adhere to ethical behaviour
	Managers and architects need to show perseverance in EA initiatives
	Architects need professional EA skills
	Stakeholders have to understand enterprise culture, vision and principles
	Stakeholders should be prepared to accept the EA challenge
	Management and architects should foster stakeholder engagement into EA
	Architects need to be dedicated to the EA initiative
	Architects and managers should be able to resolve conflict
	Stakeholders and users should accept responsibility and accountability for EA tasks
	Group/organisation affiliation and dynamics needed for EA initiatives
	Different *behaviour characteristics* needed for different work levels to show support for EA initiatives: *Enterprise architects need to show passion for EA initiative, act as advisor of EA, demonstrate support by assisting other stakeholders* Technicians and workers need to show trust, patience, loyalty, participation, engagement, honesty and focus on enterprise business priorities
	Positive attitude is needed for EA initiative
	Work satisfaction of technicians and workers – understand the balance between needs, quality of work and expenditure

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Stakeholders need to show a passion for EA - stay focused
	Accept organisational culture change
Connotation	*Use a commonly understood business and EA language*
	Define and understand EA concepts
	Conceptualise
	Understand EA metamodels
	Establish future architecture vision and definition
	Facilitate architectural modelling and implementation
	Understand work role importance
	Subjective norm

Figure 5.13 represents a graphical summary of human factors affecting EA acceptance for enterprise architects.

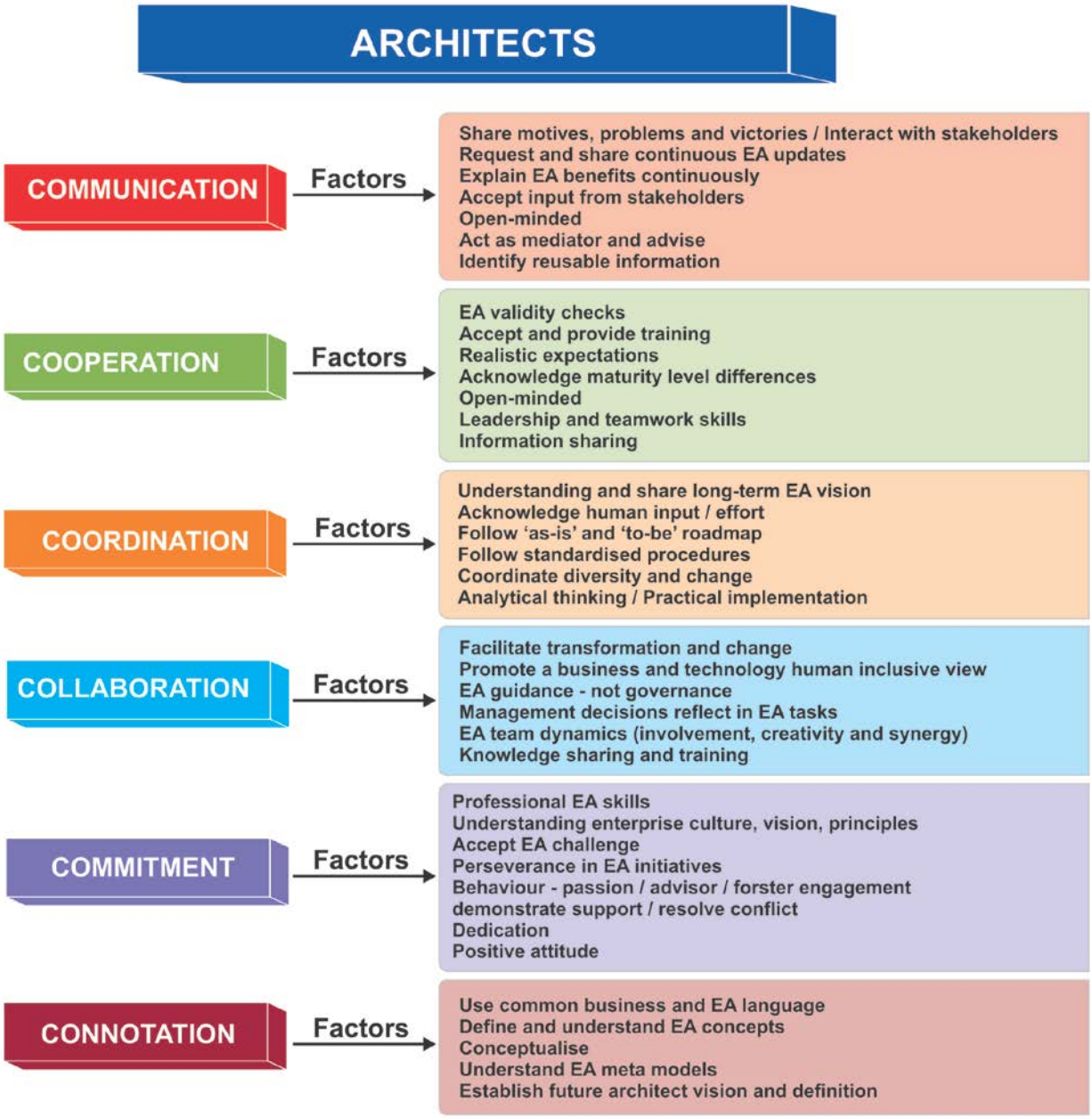


Figure 5.13: Human factors for enterprise architects

5.5.3 Analyst/Engineer Level

IM and IT people use technology to solve problems and want to produce fast, efficient answers. EA is an ongoing and long-term engineering process. Complexity in enterprises calls for paradigm shifts, mind changes, and patience when EA is accepted as a direction to address IT and business integration.

Human factors (Table 5.11) were analysed and key words, phrases and information from the exploratory interviews were used to classify human factors at analysts/engineers work level. Examples of key words, phrases and responses from interviews are highlighted using italics in Table 5.18.

Table 5.18: Human factors for analysts/engineers level mapped into human concerns

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
Communication	*Interact with all stakeholders, address their needs and share motives, problems and small victories*
	Communication: request early and continuous updates of EA tasks and results
	Acknowledge human input and effort
	Realistic expectations - continuously share benefits and results of EA
	Share knowledge with architects
	Understand and deal with global issues
	Open-minded and accept input and innovative ideas from stakeholders
	Explain perceived benefits and competitive advantages of EA
	Communication skills for all EA stakeholders – accurate reflection of intentions, allow information flow and allow decisions to filter through
	Architects and managers should act as mediators between business leaders and workers and use advisory skills
	Identify reusable information
	Understanding business, IM and IT requirements AND stakeholder concerns
	Enable information exchange and preservation
	Share some knowledge and skills but all information
	Interaction and social networking
	Provide feedback and frequent results
Cooperation	*Facilitate stakeholder involvement, cooperation and understanding of EA initiatives*
	Understand benefits and competitive advantage - perceived usefulness of EA
	Personal and organisational (group) dynamics
	Realistic expectations
	Acknowledge maturity level differences
	All stakeholders should be open-minded to accept EA initiatives and perform EA tasks
	Management and architects should do continuous validity checking
	All stakeholders should accept and provide training if needed
	Leadership and teamwork skills are needed across different work levels
	Information sharing
	Acknowledge and understand EA initiatives (business, IM and IT integration viewpoint)
	Demonstrate support for EA initiatives (accept and provide)
Coordination	Understand long-term ROI of EA
	Understand and share long term EA vision
	Acknowledge human input and effort
	Follow 'as-is' and 'to-be' roadmap
	Optimise and standardise – procedures, equipment and services
	Stakeholders should facilitate / understand transformation and change
	Coordinate diversity and change
	Think analytically, implement practically
	Adapt and adjust EA initiatives when needed
	Understand balance between needs, quality of work and expenditure on resources
Collaboration	Facilitate and manage transformation and culture change – engineering
	Promote a business and technology human inclusive view
	Risk management and financing - remuneration of effort expectation

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	Collaborate: Decision making by management should reflect in execution of EA tasks by stakeholders or teams
	Stakeholders across work levels should be involvement in EA initiative
	Architects should perform EA guidance rather than governance - governance performed by business and IT management
	Provide for EA knowledge sharing and EA training
	Solutions architecture with a purpose – based on design objectives
	Create collaboration opportunities and educate employees
	Optimise and standardise – procedures, equipment and services
	Reasonable requests for resources
	Accept authority and shared values
	Retain and reuse of information resources
	Promote stakeholder self-efficiency and work efficacy in EA initiatives
	EA stakeholder team dynamics (involvement) cultivate creativity and synergy
Commitment	Business leaders should accept ownership of business, IM and IT alignment
	Managers should show proof of personal strength and leadership skills
	Managers should show continuous adaptation (short term) and conformation of EA process (long term)
	Management should have patience with EA initiatives
	Managers should be people with integrity, be honest and adhere to ethical behaviour
	Managers and architects need to show perseverance in EA initiatives
	Architects need professional EA skills
	Stakeholders have to understand enterprise culture, vision and principles
	Stakeholders should be prepared to accept the EA challenge
	Management and architects should foster stakeholder engagement into EA
	Architects need to be dedicated to the EA initiative
	Architects and managers should be able to resolve conflict
	Stakeholders and users should accept responsibility and accountability for EA tasks
	Group/organisation affiliation and dynamics needed for EA initiatives
	Different behaviour characteristics needed for different work levels to show support for EA initiatives
	Positive attitude is needed for EA initiative
	Work satisfaction of technicians and workers – understand the balance between needs, quality of work and expenditure
	Stakeholders need to show a passion for EA - stay focused
	Accept organisational culture change
Connotation	*Use a commonly understood business and EA language*
	Define and understand EA concepts
	Conceptualise
	Understand EA metamodels
	Establish future architecture vision and definition
	Facilitate architectural modelling and implementation
	Understand work role importance
	Subjective norm

Figure 5.14 represents a graphical summary of human factors affecting EA acceptance for analysts and engineers.

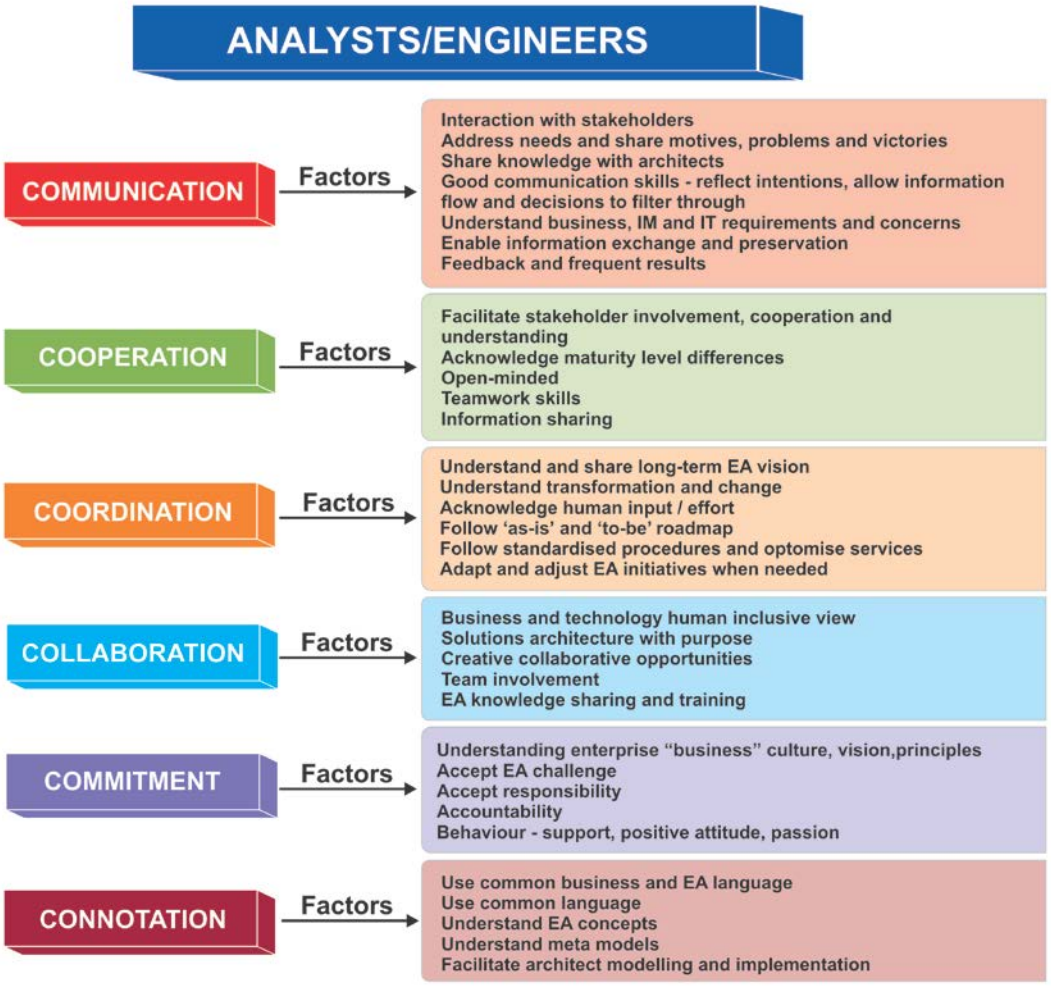


Figure 5.14: Human factors for analysts/engineers

5.5.4 Technician/Worker Level

Workers, stakeholders and users are the workforce of an enterprise. It is at this work level where acceptance of EA is needed to ensure synergy in the socio-technical environment of an enterprise's business and IM integration. Workers in the technical, IT and IM divisions of organisations have traditionally been used to fulfil a business-support- and problem-solving role. In a dynamic, fast changing and information-dominated enterprise environment acceptance of EA to understand the 'as-is' and 'to-be' states of an organisation (the bigger picture) is non-negotiable. Human factors (Table 5.11) were analysed and key words, phrases and information from the exploratory interviews were used to classify human factors at technicians/workers level. Examples of key words, phrases and responses from interviews are highlighted using italics in Table 5.19.

Table 5.19: Human factors for technicians/workers mapped into human concerns

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
Communication	*Interact with all stakeholders, address their needs and share motives, problems and small victories*
	Communication: provide feedback and continuous updates of EA tasks and results
	Acknowledge human input and effort
	Realistic expectations - continuously share benefits and results of EA
	Share knowledge with architects
	Understand and deal with global issues
	Open-minded and accept input and innovative ideas from stakeholders
	Explain perceived benefits and competitive advantages of EA
	Communication skills for all EA stakeholders – accurate reflection of intentions, allow information flow and allow decisions to filter through
	Architects and managers should act as mediators between business leaders and workers and use advisory skills
	Identify reusable information
	Understanding business, IM and IT requirements AND stakeholder concerns
	Enable information exchange and preservation
	Share some knowledge and skills but all information
	Interaction and social networking
Cooperation	*Stakeholder involvement and cooperation in EA initiatives*
	Understand benefits and competitive advantage - perceived usefulness of EA
	Personal and organisational (group) dynamics
	Realistic expectations
	Acknowledge maturity level differences
	All stakeholders should be open-minded to accept EA initiatives and perform EA tasks
	Management and architects should do continuous validity checking
	All stakeholders should accept and provide training if needed
	Leadership and teamwork skills are needed across different work levels
	Information sharing
	Acknowledge and understand EA initiatives (business, IM and IT integration viewpoint)
	Demonstrate support for EA initiatives (accept and provide)
Coordination	*Understand role of EA in transformation and change*
	Understand and share long term EA vision
	Acknowledge human input and effort
	Follow 'as-is' and 'to-be' roadmap
	Optimise and standardise – procedures, equipment and services
	Stakeholders should facilitate / understand transformation and change
	Coordinate diversity and change
	Think analytically, implement practically
	Adapt and adjust to EA initiatives when needed
	Understand balance between needs, quality of work and expenditure on resources
Collaboration	Facilitate and manage transformation and culture change – engineering
	Adapt to a business and technology human inclusive view
	Risk management and financing - remuneration of effort expectation
	Collaborate: Decision making by management should reflect in execution of EA tasks by stakeholders or teams
	Stakeholders across work levels should be involvement in EA initiative
	Architects should perform EA guidance rather than governance - governance performed by

HUMAN CONCERNS (6EAHCs)	HUMAN FACTOR
	business and IT management
	Provide for EA knowledge sharing and accept EA training
	Solutions architecture with a purpose – based on design objectives
	Create collaboration opportunities and educate employees
	Optimise and standardise – procedures, equipment and services
	Reasonable requests for resources
	Accept authority and shared values
	Retain and reuse of information resources
	Promote stakeholder self-efficiency and work efficacy in EA initiatives
	EA stakeholder team dynamics (involvement) cultivate creativity and synergy
Commitment	Business leaders should accept ownership of business, IM and IT alignment
	Managers should show proof of personal strength and leadership skills
	Managers should show continuous adaptation (short term) and conformation of EA process (long term)
	Management should have patience with EA initiatives
	Managers should be people with integrity, be honest and adhere to ethical behaviour
	Managers and architects need to show perseverance in EA initiatives
	Architects need professional EA skills
	Stakeholders have to understand enterprise culture, vision and principles
	Stakeholders should be prepared to accept the EA challenge
	Management and architects should foster stakeholder engagement into EA
	Architects need to be dedicated to the EA initiative
	Architects and managers should be able to resolve conflict
	Stakeholders and users should accept responsibility and accountability for EA tasks
	Group/organisation affiliation and dynamics needed for EA initiatives
	Different behaviour characteristics needed for different work levels to show support for EA initiatives: technicians and workers need to show trust, patience, loyalty, participation, engagement, honesty and focus on enterprise business priorities
	Positive attitude is needed for EA initiative
	Work satisfaction of technicians and workers – understand the balance between needs, quality of work and expenditure
	Stakeholders need to show a passion for EA - stay focused
	Accept organisational culture change
Connotation	*Use a commonly understood business and EA language*
	Understand EA concepts
	Conceptualise
	Understand EA metamodels
	Establish future architecture vision and definition
	Facilitate architectural modelling and implementation
	Understand work role importance
	Subjective norm

Figure 5.15 represents a graphical summary of human factors affecting EA acceptance for technicians and workers.

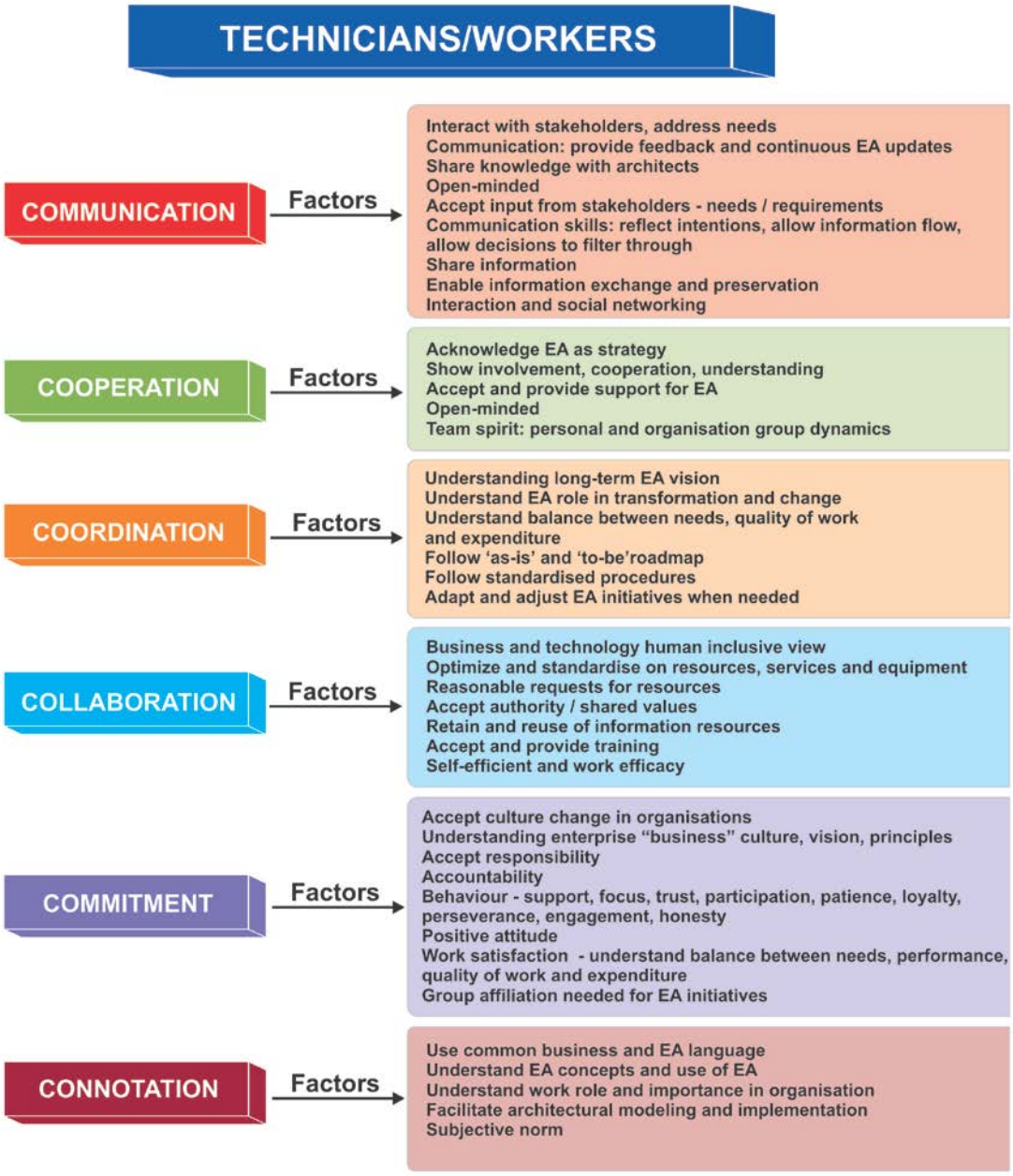


Figure 5.15: Human factors for technicians/workers

The four work-role-related lists of human factors were named Work Level Acceptance Framework for EA Model Version 1 (WoLAF for EA Model V1).

5.6 EVALUATING WOLAF FOR EA V1

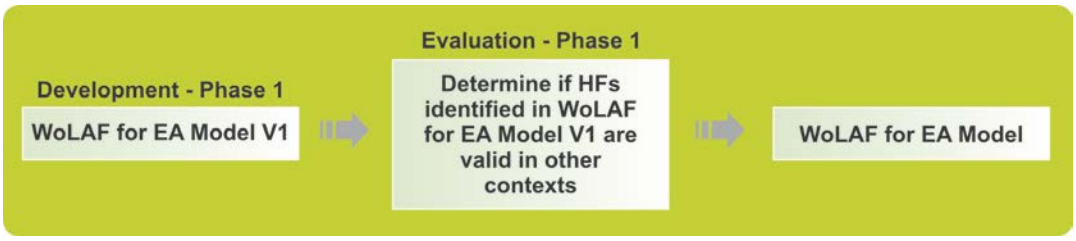


Figure 5.16: Main design research Development Phase 1

In an evaluation phase of Development Phase 1, the applicability of WoLAF for EA V1 to other contexts was determined. Different from in the initial exploratory study, where human factors impacting on EA were first identified, work levels identified for the research were now used to categorise human factors and formed part of the investigation and evaluation. Questionnaires were used to determine whether the comprehensive list of human factors impacting on EA acceptance, categorised into work levels, are valid in more than one context.

The initial exploratory study to identify human factors impacting on EA acceptance was performed in one organisation. The purpose and context of organisations differ and therefore a logical next step in the research process, for ensuring the research's rigour and validity, was to determine if the human factors identified in one organisation and the literature review, were valid in other organisations and contexts.

The evaluation consisted of three actions: First, a pilot questionnaire was developed and tested; second, the pilot questionnaire was adjusted and the questionnaire was compiled and distributed; third, responses were analysed and results generated.

5.6.1 Pilot Questionnaire

In a pilot questionnaire, the readability, understanding and suitability of the questions in a web-based online, interactive questionnaire for different work levels, were tested. Questions were compiled according to the human factors listed for the four work levels in Section 5.5. Questions in the pilot questionnaire were tested for clear understanding, unambiguousness and validity in context (Zikmund *et al.*, 2013:360). The pilot questionnaire was distributed to 13 respondents in two enterprises.

Feedback from eight respondents representing all four work levels revealed the following:

- A few questions were ambiguous.
- Some of the radio buttons used for response choices did not show on some internet browsers.
- In two questions the term "processes" was a better descriptive term than "projects".
- Age categories did not show in the correct format.
- In the initial questionnaire, a few open-ended questions were included with the purpose of collecting data about participants' opinions or feelings. Participants were reluctant to type answers to open-ended questions.

The pilot questionnaire was revised. Technical problems were addressed, ambiguous questions were revised and corrected, and open-ended questions were redesigned into questions where choice of answer(s) could be selected by clicking a radio button if one answer was preferred or checking boxes for more than one answer. Participants were asked for comments in one last open-ended question at the end of the questionnaire (see accompanying disk).

5.6.2 Questionnaire – Respondents

The request for completion of the revised questionnaire was sent to six people from different enterprises via e-mail. These six people were also asked to distribute the questionnaire's web address and request for completion to other possible participants in their own and other organisations.

Twenty-nine responses representing different contexts were received. Respondents that participated in the data collection represented organisations form the different contexts of banking, manufacturing and different government and semi-government sections such as national safety, revenue services and national administration services. All the enterprises represented by the respondents were either using EA as a strategy to address complexity and change or had started implementing EA in sub-organisations of the enterprises.

Responses received were mostly anonymous, unless respondents replied via e-mail to comment on the study or asked to be informed about the results and outcome of the study. Responses were grouped on indication of work level and then analysed. Twenty-six full responses were received and three respondents did not complete the questionnaire. It was decided to discard the three incomplete responses. Twenty-six full responses were analysed: eleven responses came from the executive/management level; six responses from the architect level; two from the analyst/engineering level; and seven from the technician/worker level (Appendix B).

5.6.3 Questionnaire – Findings

The researcher's aim was to strengthen validity of the original exploratory study's findings of human factors affecting EA acceptance in one organisation by using a questionnaire to determine if the human factors identified are valid in a number of different organisations. Participants in two of the four work levels identified for the research were asked to indicate their work-role responsibilities in the questionnaire. This was done to distinguish and understand participants' work roles and EA relation, and their work-role related EA viewpoints. For example, considering the nature of their work roles, a manager of an organisational business unit might have a very different EA viewpoint than that of an IT manager.

Responses were analysed to confirm that human factors affecting EA acceptance as identified in the exploratory study and the literature review and now mapped to different work levels are valid in more contexts. Furthermore, responses were analysed to confirm the categorisation into human concerns (EAHCs).

5.6.3.1 Organisational Work Level

According to Rowbottom and Billis (1987:22), organisational work "varies in level as well as in kind". The following four work level categories and the expected type of work (work role) in each category as described by Rowbottom and Billis (1987:24) are significant for my research:

- Prescribed output (Level 1) – concrete tasks with pre-set objectives (Technicians/Workers).
- Situational response (Level 2) – concrete tasks with objectives set according to specific situations (Analysts/Engineers).
- Systematic provision (Level 3) – needs in open-ended situations determine the expected work (Architects).
- Comprehensive provision (Level 4) – providing services or products throughout an organisation or society (Executives/Managers).

5.6.3.2 EA Audience Work Level

Stakeholders representative of different EA audience work levels will address EA related tasks from their specific organisational work levels and therefore use different models to represent organisational enterprise functions. For example a business manager will address EA-related tasks from the executive/manager EA audience work level whereas an IT manager might address EA-related tasks from the analysts/engineers or technicians/workers EA audience work levels. Respondents from two work levels were asked to provide an indication of their work responsibilities or work role: executive/manager level and technicians/worker level. Some respondents indicated more than one work role. At the executive/management level, work roles distinguished were executive management (1), business management (4), project management (8), process management (6), enterprise/IM/IT governance (1), business/stakeholder management (1), general management (2) and account/finance manager (2). At the technicians/worker level respondents were asked to indicate their work-role responsibilities and the following options were distinguished or combined: systems maintenance (1), process maintenance (5), technical maintenance (1), technical services (3), employee services (1), public human services (0), project services/support (6), training services/support (4) and solutions design (1).

The work role description for an architect was listed in the questionnaire as enterprise architect, change management leader or IM leader. Respondents were not asked to distinguish between these work roles. It was the researcher's belief and experience that responsibilities for this work role in EA are defined for the EA domains of technology, data, applications, and business and that human factors that affect EA would be the same for enterprise architects from all four domains (EARF, 2009; TOGAF, 2009:744). The work roles for the analysts/engineers level were explained in the questionnaire as business-IT analyst, systems analyst, business-IM analyst or IM expert. Work-role responsibilities for people from the analyst/engineer work level include the design of processes and technology to support information management and business initiatives (Section 5.4.3).

The distribution of respondents correlated to the ratio of stakeholders typically representative of the different work roles in organisations (Figure 7.5).

5.6.3.3 Executives/Managers

The questionnaire for executives/managers had 42 questions related to human factors. Eleven responses were analysed and categorised. Questions posed with regards to the human factors could all be classified as related to one or more of the human concerns. Some responses could be categorised into more than one human concern category for example: In my organisation it is important that employees/stakeholders share my vision for the organisation could be categorised under collaboration and cooperation. Table 5.20 is used to summarise some of the questionnaire results of importance to the study from the executive/manager work levels according to the six EAHCs. A complete summary of the results is available in Appendix B on the accompanying disk.

Table 5.20: Responses from executive/manager work level

QUESTIONNAIRE RESPONSES: EXECUTIVES / MANAGERS			
Six human concerns (6EAHCs)	**Questions related to human concern**	**Examples of questions related to EA acceptance problems**	**Responses (%): Strongly Disagree/ Disagree/Agree/Strongly Agree/No Answer**
Communication	11	I share organisational victories/successes with stakeholders/employees	0/27/27/36/9
		I share organisational motives and drives with stakeholders/employees	0/9/45/36/9
Cooperation	6	It is important that employees/stakeholders share my vision for the organisation	9/18/45/18/9
		I take decisions only after I have consulted with other managers	0/27/55/0/18
		I take decisions only after I have consulted with co-workers/employees/stakeholders	0/36/55/0/9
		I acknowledge different levels of maturity in organisational issues	0/0/36/55/9
Coordination	4	At certain points it is important for employees/stakeholders to know the organisation's 'as-is' and 'to-be' status	0/0/36/55/9
		Standardisation in the business, IM and IT integration processes is currently addressed	9/9/64/9/9
Collaboration	12	People from al work levels are included in organisational change processes	0/18/36/36/9
		The needs of employees/stakeholders are addressed	0/18/45/27/9
		I rely on support of employees/stakeholders	0/0/18/72/9
		I trust employees/stakeholders	18/0/54/18/9
		It is important that employees/stakeholders share my vision for the organisation	9/18/45/18/9
		I take decisions only after I have consulted with other managers	0/27/55/0/18

		I take decisions only after I have consulted with co-workers/employees/stakeholders	0/36/55/0/9
		It is important to manage human factors impacting on business, IM and IT processes	0/0/45/45/9
		I acknowledge different skills of employees/stakeholders	0/0/27/64/9
Commitment	9	EA is acknowledged as a business, IM and IT alignment platform	0/9/36/45/9
		I facilitate and manage organisational change	0/18/27/27/27
		Fast ROI is important	0/18/45/27/9
Connotation	2	Employees/stakeholders and I share a common language	0/18/45/27/9

5.6.3.4 Architects

The questionnaire for enterprise architects had 41 questions related to human factors. Six responses were analysed and categorised. Question posed with regards to the human factors could all be classified as related to one or more of the human concerns. Some responses could be categorised into more than one EAHC category; for example, "In my organisation I continuously share my long-term vision for EA" could be categorised under communication and coordination – the reason being that an architect should continuously communicate and share the EA vision with stakeholders and it is usually the responsibility of an architect to understand and coordinate ongoing EA processes. Table 5.21 is used to summarise some of the questionnaire results of importance to the study from the architect work level according to the six EAHCs. A complete summary of the results is available on the accompanying disk.

Table 5.21: Responses from the architect work level

QUESTIONNAIRE RESPONSES: ARCHITECTS			
Six human concerns (6EAHCs)	**Questions related to human concern**	**Examples of questions related to EA acceptance problems**	**Responses (%): Strongly Disagree/ Disagree/Agree/Strongly Agree/No Answer**
Communication	12	Communication is about giving information	17/17/33/17/17
Cooperation	4	Human cooperation is an important asset in the business-IM-IT alignment process	0/0/33/67/0
		EA will succeed as a strategy when there is human cooperation across different work levels	0/0/083/17
		I acknowledge different levels of maturity in organisational issues	0/0/67/33/0
		People have realistic expectations of business-IM-IT integration	0/83/17/0/0

Coordination	19	EA is acknowledged as a business, IM and IT alignment platform	0/33/33/33/0
		Managers accept EA as a strategy	0/33/33/0/33
		Fast ROI is important	17/17/67/0/0
		There are socio-technical (human) factors impacting on business, IM and IT alignment processes	0/0/17/67/17
		I acknowledge different levels of maturity in organisational issues	0/0/67/33/0
		Standardisation and reuse are goals in the business-IM-IT integration process	0/0/33/67/0
Collaboration	5	Knowledge sharing across different work levels are supported and recommended	0/50/50/0/0
Commitment	4	My role is important in organisational change processes such as EA	0/0/17/83/0
Connotation	3	Managers/employees/stakeholders and I share a common language	0/33/33/17/17
		Managers/employees/stakeholders understand the concept of EA	0/67/17/0/17

5.6.3.5 Analysts/Engineers

The questionnaire for analysts/engineers had 39 questions related to human factors. Two responses were analysed and categorised. Question posed with regards to the human factors could all be classified as related to one or more of the human concerns. Some responses could be categorised into more than one EAHC category; for example, “In my organisation human differences in perception and levels of skill assist in the business-IM-IT alignment processes” could be categorised under cooperation, coordination and collaboration Traditionally, analysts and engineers are designers, builders and implementers of technology systems meant to support an organisation’s core business and initiatives. People from this work level have been recorded as technology-focused and not always acknowledging the human involvement in technology-related initiatives and problem solving. Table 5.22 is used to summarise some of the questionnaire results of importance to the study from the analyst/engineer work level according to the six EAHCs. A complete summary of the results is available in Appendix B on the CD provided with the thesis.

Table 5.22: Responses from the analyst/engineer work level

QUESTIONNAIRE RESPONSES: ANALYSTS/ENGINEERS			
Six human concerns (6EAHCs)	**Questions related to human concern**	**Examples of questions related to EA acceptance problems**	**Responses (%): Strongly Disagree/ Disagree/Agree/Strongly Agree/No Answer**

Communication	8	I consult with managers before I make decisions	0/0/50/50/0
		I take decisions only after I have consulted with co-workers/stakeholders/employees	0/0/50/50/0
Cooperation	11	People from all work levels are involved in organisational change	0/0/50/50/0
		Human factors impact on business-IM-IT alignment processes	0/0/50/50/0
		Different levels of maturity in organisational issues are acknowledged	0/50/0/50/0
		Realistic expectations of business-IM-IT integration exists	50/50/0/0/0
Coordination	9	Information management and the technical needs of employees/stakeholders initiate change	0/0/0/100/0
		Organisational change processes such as EA happen	0/50/50/0/0
		Fast ROI is important	0/0/50/50/0
		Employees/stakeholders know about the organisation's 'as-is' and 'to-be' status	0/50/50/0/0
		The issue of standardisation in the business-IM-IT integration process is addressed	50/0/50/0/0
Collaboration	9	People from all work levels are involved in organisational change	0/0/50/50/0
		Change happens as a result of needs identified in business processes	0/0/50/50/0
		Human factors impact on business-IM-IT alignment processes	0/0/50/50/0
		Knowledge is shared across different work levels	0/50/50/0/0
Commitment	9	Fast ROI is important	0/0/50/50/0
		Responsibilities are shared	0/50/0/50/0
Connotation	4	I take decisions only after I have consulted with co-workers/stakeholders/employees	0/0/50/50/0
		Business and IM is described	0/50/0/50/0

5.6.3.6 Technicians/Workers

The questionnaire for technicians/workers had 46 questions related to human factors. Seven responses were analysed and categorised. Respondents' work responsibilities included: systems- and process maintenance, technical- services and maintenance, employee services, public human services, project- and training services and support. Question posed with regards to the human factors could all be classified as related to one or more of the human concerns. Some responses could be categorised into more than one EAHC category; for example, "In my organisation employees/stakeholders are motivated to cooperate in the business-IM-IT alignment processes" could be categorised under communication, cooperation, collaboration

and commitment – the reason being that technicians and workers usually have specific work tasks and that the perception of management is often that technicians and workers do not have to cooperate in and fully understand enterprise-wide strategies and alignment processes. Table 5.23 is used to summarise some of the questionnaire results of importance to the study from the technician/worker work level according to the six EAHCs. A complete summary of the results is available on the accompanying disk.

Table 5.23: Responses from the technician/worker work level

QUESTIONNAIRE RESPONSES: TECHNICIANS/WORKERS			
Six human concerns (6EAHCs)	**Questions related to human concern**	**Examples of questions related to EA acceptance problems**	**Responses (%): Strongly Disagree/ Disagree/Agree/Strongly Agree/No Answer**
Communication	5	Communication means receiving messages about work organisation and operation	14/0/71/14/0
		We speak the same language and understand each other	14/29/29/29/0
		I make sure that managers/employees/stakeholders understand my message	0/0/14/86/0
		Managerial decisions are communicated and explained to me	0/43/29/29/0
		We share in realistic expectations of business-IM-IT integration	14/14/57/14/0
Cooperation	23	Business, IM and IT should be aligned	0/0/0/100/0
		The impact of organisational changes should be visible	0/0/14/86/0
		Responsibilities are shared by co-workers	0/0/57/43/0
		I work better if I work alone	0/29/71/0/0
		Human factors affect work projects	0/0/29/71/0
		I am consulted before decisions are finalised when my work is affected by such decisions	14/14/43/29/0
		Human cooperation across different work levels is necessary for EA to succeed	0/0/29/71/0
		Human factors impacting on business-IM-IT processes are managed	14/29/57/0/0
		We share in realistic expectations of business-IM-IT integration	14/14/57/14/0
Coordination	6	Business, IM and IT should be aligned	0/0/0/100/0
		The impact of organisational changes should be visible	0/0/14/86/0
		I am consulted before decisions are finalised when my work is affected by such decisions	14/14/43/29/0

Collaboration	18	The impact of organisational changes should be visible	0/0/14/86/0
		Responsibilities are shared by co-workers	0/0/57/43/0
		I work better if I work alone	0/29/71/0/0
		Human factors affect work projects	0/0/29/71/0
		Training is provided if necessary	14/29/43/14/0
Commitment	16	I work better if I work alone	0/29/71/0/0
		I trust my superiors	14/14/43/29/0
Connotation	12	Business, IM and IT should be aligned	0/0/0/100/0
		We speak the same language and understand each other	14/29/29/29/0
		We use different terms to describe the business-IM-IT alignment processes	29/0/43/29/0
		I work better if I work alone	0/29/71/0/0
		EA is the work of a group of specialised people	14/14/14/57/0

5.6.3.7 Overall Analysis

Responses to questions from all four work levels related to specific human concerns were analysed and compared. Every question was carefully evaluated and responses to some of the questions could be placed in more than one human concern category as shown in tables 5.18 to 5.21. Responses from corresponding questions across the different work levels were compared to verify specific human factors that impact on EA related work relationships. Contradictory responses showed that human factors related to a specific human concern for a specific work level were not considered to be problematic to people representing that specific work level but responses from other work levels on that specific human concern showed how representatives of other work levels found it to be problematic. For example, 63 percent of managers said they share organisational victories and successes with employees and stakeholders and 81 percent said they share organisational motives and drives with employees and stakeholders but 43 percent of the technicians and workers disagreed that managerial decisions were communicated and explained to them. Ninety percent of managers admitted that they rely on the support of employees and stakeholders but 36 percent admitted that employees and stakeholders are not included in decision making processes. Twenty seven percent of managers did not consult with other managers before taking decisions and to 18 percent of managers it was not important that employees and stakeholders share their vision for the organisation.

Enterprise architects (67 %) felt that managers, stakeholders and employees did not understand the concept of EA and 33 percent stated that EA is not accepted as a strategy. Eighty three percent of the enterprise architects strongly agreed that EA will succeed as a strategy if there is human cooperation across different work levels and 50 percent said that knowledge sharing across different work levels were not supported and recommended in their organisations. Eighty three percent of the enterprise architects stated that people do not have realistic expectations of EA.

The purpose of the evaluation of WoLAF for EA Model V1 was twofold:

- to determine validity of human factors identified for one organisation in more contexts and
- to validate the work level classification of human factors.

Questionnaires were distributed in more organisations and after results were analysed, different human factors for different work levels were confirmed to be valid in more than one context (Section 5.6).

5.7 THE WORK-LEVEL ACCEPTANCE FRAMEWORK FOR ENTERPRISE ARCHITECTURE MODEL (WOLAF FOR EA MODEL)

A need for the development of a framework of human factors for EA management of EA acceptance was suggested in the main design research cycle of the research (Section 4.8.1.1) after which two research objectives (RO1: *To design a model that will assist organisations in management of EA acceptance* and RO2: *To propose a method to use the model to assist organisations for management of EA acceptance*) were composed for the research. RO2 is addressed in Chapter 6. In this section, Table 5.24 is used to provide a short summary of all the research actions followed and knowledge gained that were used to compile the WoLAF for EA Model. The model is presented in Figure 5.17 after which an explanation of how the model was constructed follows in Section 5.7.1.

Table 5.24: Summary of research actions and knowledge gained or generated to compile the WoLAF for EA Model

RESEARCH ACTIONS	KNOWLEDGE GAINED/GENERATED
1. Exploratory study (Section 5.2.1).	Human factors impacting on EA acceptance identified.
2. Literature review (Section 5.2.2).	Human factors applicable to EA identified from literature.
3. Compile an integrated list of human factors (exploratory study and literature review) (Section 5.2.3) (SO1.1).	Comprehensive list of human factors impacting on EA acceptance compiled from practice and theory.
4. Define a classification scheme for human factors (Section 5.3).	Classification scheme of six human concerns (HCs) identified from literature.
5. Map comprehensive list of human factors into six human concerns (EAHCs) (Section 5.3.1.8) (SO1.3).	A list of human factors classified into six identified EAHCs.
6. Literature review to determine work levels applicable to EA (Section 5.4) (SO1.2).	Work levels applicable to EA and the research defined.
7. Compile a first version of WOLAF for EA Model (Section 5.5).	Human factors categorised into EAHCs, mapped into work levels.
8. Evaluation of WoLAF for EA V1 (Section 5.6).	WoLAF for EA V1 is valid in more than one organisational context. The classification scheme for human factors (EAHCs for different work levels) is confirmed and valid.
9. Compose WoLAF for EA Model.	A model is used to explain the impact of human factors on EA acceptance across levels related to human involvement in an EA related organisational hierarchy.

The WoLAF for EA Model is a high-level conceptual model that constitutes:

- Three model levels: work level, human factor and human factor classification.
- Six model entities: organisational work level, EA audience work level, acceptance factor, EA specific acceptance factor, human concern, EA human concern.
- Relationships between model entities that span across the three model levels to explain how the model entities interrelate.

From the definition of EA accepted for the research (*EA is the continuous practice of describing the essential elements of a socio-technical organisation, their relationships to each other and to the environment, in order to understand complexity and manage change*), discussions with experts and during the course of the literature review and data gathering of the research three hierarchical levels have been identified as significant to the research (sections 1.1, 3.2.2, 3.2.3 and 5.4). In Figure 5.17, the WoLAF for EA Model depicts the levels of:

- Work level.
- Human factor.
- Human factor classification.

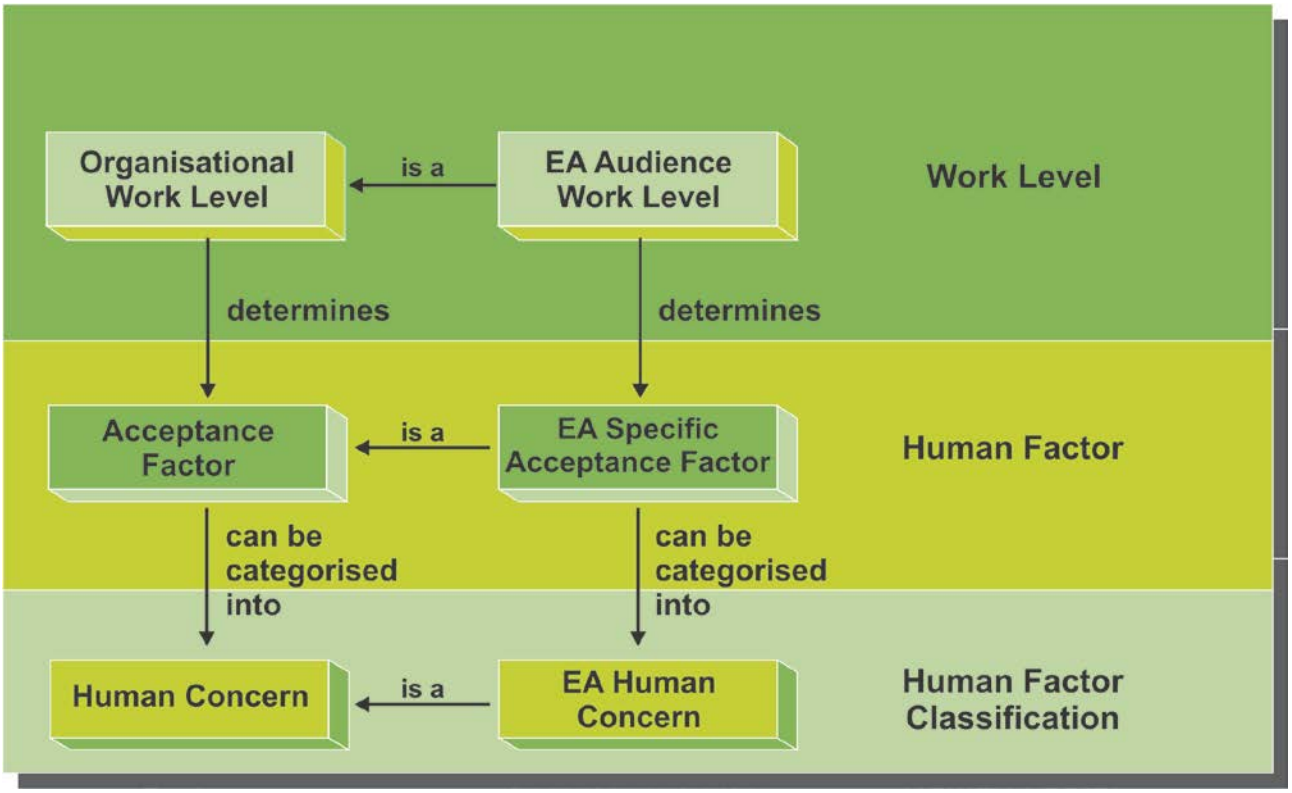


Figure 5.17: Model explaining WoLAF for EA

In a first design research development phase, the WoLAF for EA model was developed. A first version of WoLAF for EA Model (WoLAF for EA Model V1) was composed after an exploratory study had been

conducted in one South African organisation to identify possible human factors impacting on EA acceptance. Valuable awareness emerged from interviews and a focus group. The literature was used to extend the list of human factors identified from the exploratory study. Incidence of human factors affecting acceptance were found in the literature on technology and EA and incorporated into the findings of the exploratory study (Section 5.2.2). A comprehensive list of human factors was compiled (Section 5.2.3). After a classification scheme for human factors was identified from literature, the comprehensive list of human factors was mapped into EA human concerns. Work levels applicable to EA were derived from literature and the comprehensive list of human factors, mapped into EA human concerns were classified into EA audience work levels.

The primary levels of the WoLAF for EA Model constitute:

- work level;
- human factor; and
- human factors classification.

5.7.1 Work Level

The entities of *organisational work level* and *EA audience work level* and the relationship between them are depicted in Figure 5.18. The generic *organisational work level* was defined for the research in Section 5.6.3.1. The *EA audience work levels* is an organisational work level specifically aimed at EA and were identified from the literature and adjusted to conform to assumptions of the study (Table 5.15, Figure 5.19 and sections 2.5.1, 5.4 and 6.3.2).

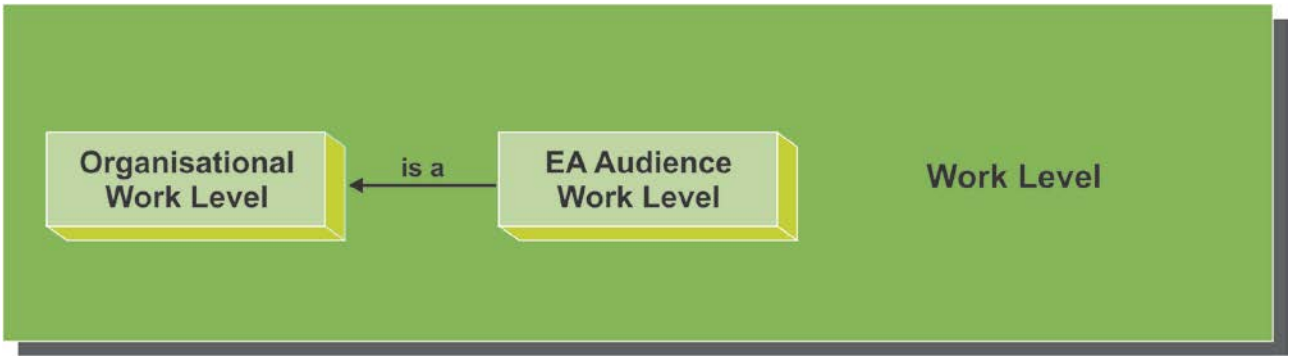


Figure 5.18: "Work level" model level perspective

5.7.2 Human Factor

The first part of the research question of the study (*What are the human factors that affect the acceptance of enterprise architecture?*) initiated the investigation into human factors impacting on EA acceptance in organisations. Humans are perceived as one of the most important assets of organisations. Human factors have been recorded as affecting organisational success or failure (Section 3.2). In my research *human factor* refers specifically to the personal and interpersonal character, personality and socio-technical traits of people

that affect acceptance of organisational strategies such as EA. Human factors have been described in sections 3.6, 3.7 and Table 5.11.

The model entities of *acceptance factor* and *EA specific acceptance factor* constitute the model level of human factor. Acceptance factors were identified from models and theories in the literature (Sections 3.6). A list of EA specific acceptance factors were identified from the exploratory study and extended by EA specific acceptance factors identified from the EA literature (sections 5.2, 3.6 and 3.7). It was the argument of the research that EA is used to address complexity and change in enterprises and that for EA to be successfully implemented as an organisational strategy, acceptance of EA can be managed at work levels (in groups) or individually for example at a worker or technician work level (Section 5.4.3 and Figure 5.19).

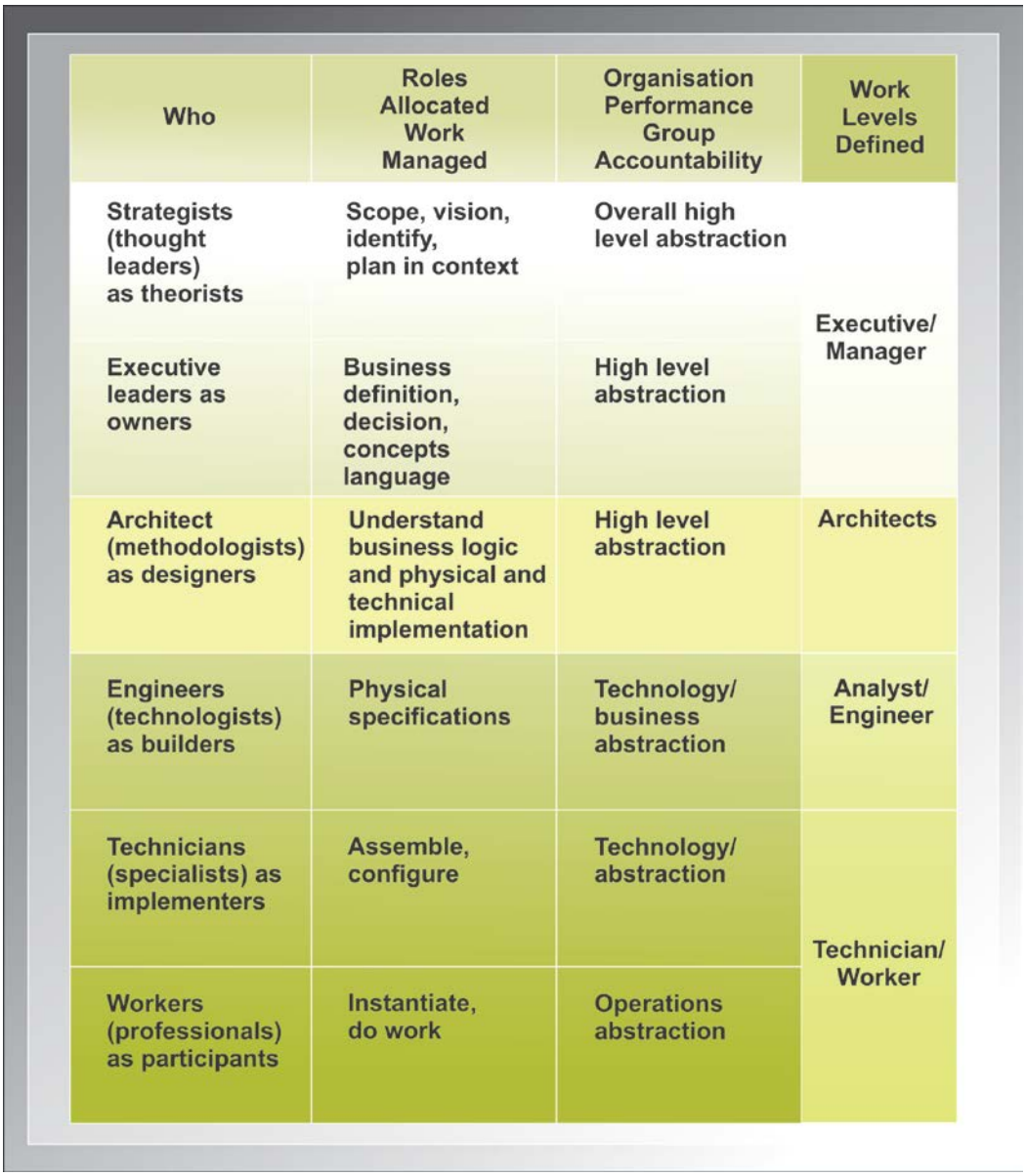


Figure 5.19: EA specific work levels for the research defined

The relationships that link the work level entities to the human factor entities are graphically presented (Figure 5.20):

- From the work level model-level perspective the organisational work level entity determines acceptance factors.
- From the work level model-level perspective the EA audience work level determines the EA specific acceptance factors.
- From the human factor model-level perspective an EA specific acceptance factor is an acceptance factor.

All human factors identified in the research were classified into four appropriate EA audience work levels (Executive leaders/Managers, Architects, Analysts/Engineers, Technicians/Workers) (Section 5.5; figures 5.12 to 5.15).

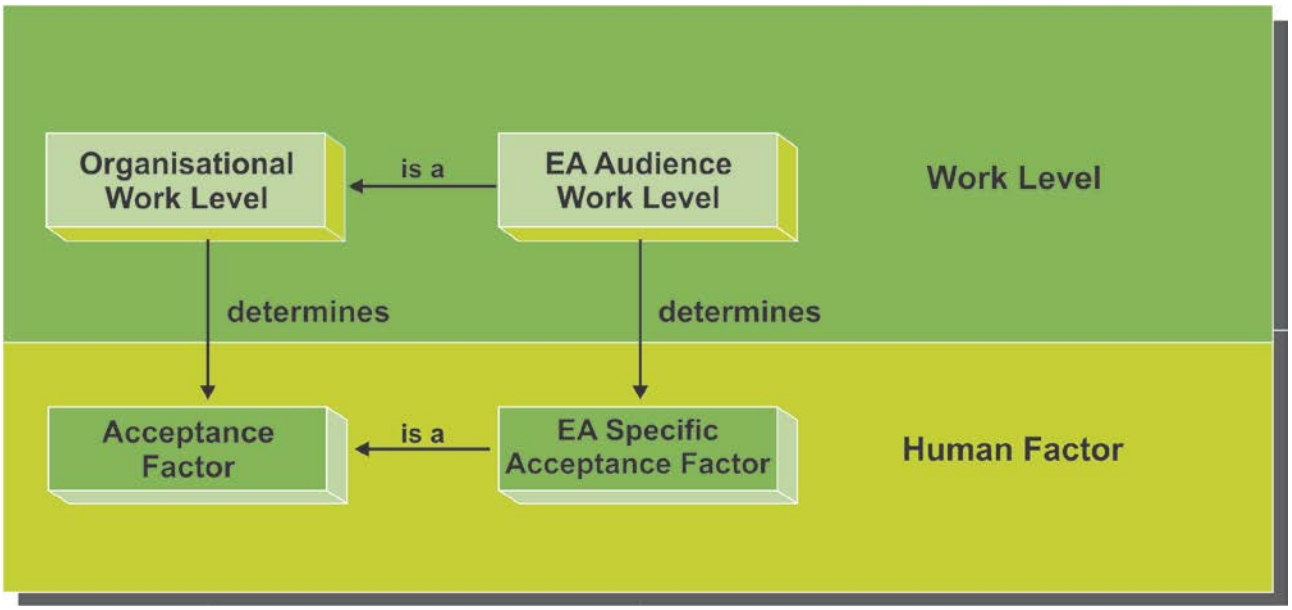


Figure 5.20: Work level and human factor model level perspectives

5.7.3 Human Factor Classification

The model entities of *EA human concern* and *human concern* are depicted in Figure 5.21. The comprehensive list of human factors initially identified from the exploratory study and literature was found to be unordered and cumbersome. Inductive analysis of the comprehensive list of human factors was performed to identify related human factors and a possible classification scheme was identified. Literature was consulted and used to define and compose appropriate categories of human concerns useful for the research (Section 5.3). A classification scheme of six human concerns named enterprise architecture human concerns (EAHCs) were identified from the literature and described for the research (sections 4.8.1.2.3 and 5.3 and Figure 5.6).

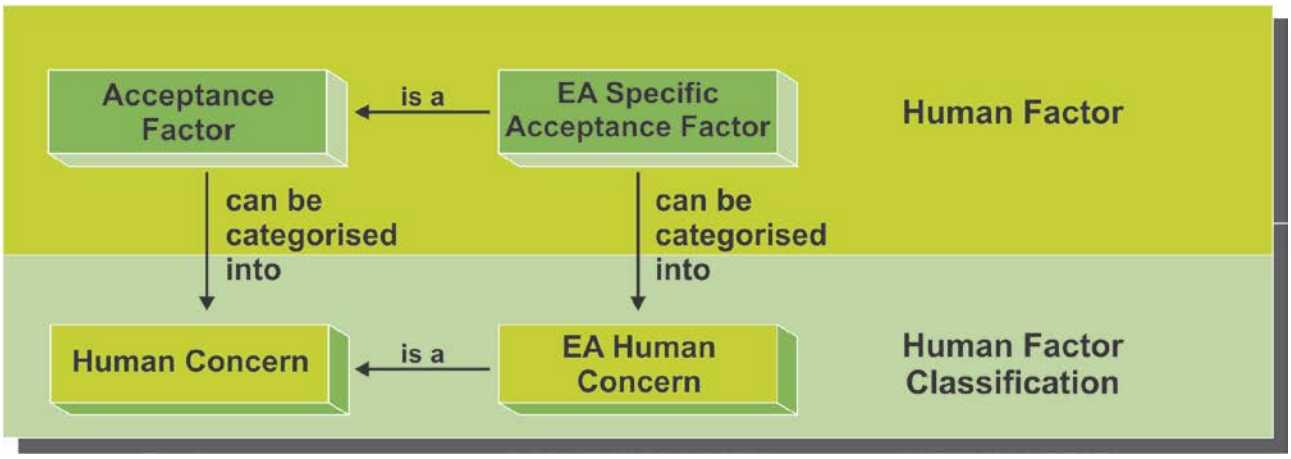


Figure 5.21: Human factor and human factor classification model level perspectives

TOGAF (2009:36) defines the work role of employees in organisations as the *expected function of an actor in a specific action or event* and *the part an individual plays in an organisation and the contribution of their skills, knowledge, experience and abilities*. For example, the assistance of a business project manager (typically on the EA audience executive/manager level) may be required to provide expert knowledge in improvement or adjustments to the technology specification models (typically on the EA audience technicians/workers level). The EA role of an employee is connected to responsibility and accountability for EA-related work and tasks and therefore the EA role can generate EA specific acceptance factors and EA human concerns at the human factor classification level of the WoLAF for EA Model

The relationships between the human factor model entities and the human factors classification model entities are (Figure 5.21):

- Acceptance factors can be categorised into human concerns.
- EA specific acceptance factors can be categorised into EA human concerns.
- An EA human concern is a human concern.

In a first version of WoLAF for EA Model (WoLAF for EA Model V1) the comprehensive list of human factors, categorised into EA audience work levels was mapped to the six EAHCs of communication, cooperation, coordination, collaboration, commitment and connotation (Section 5.3.1.8 and figure 5.22 and 5.23). EA human concerns will evolve from employees in work roles affiliated to EA in an organisational context.

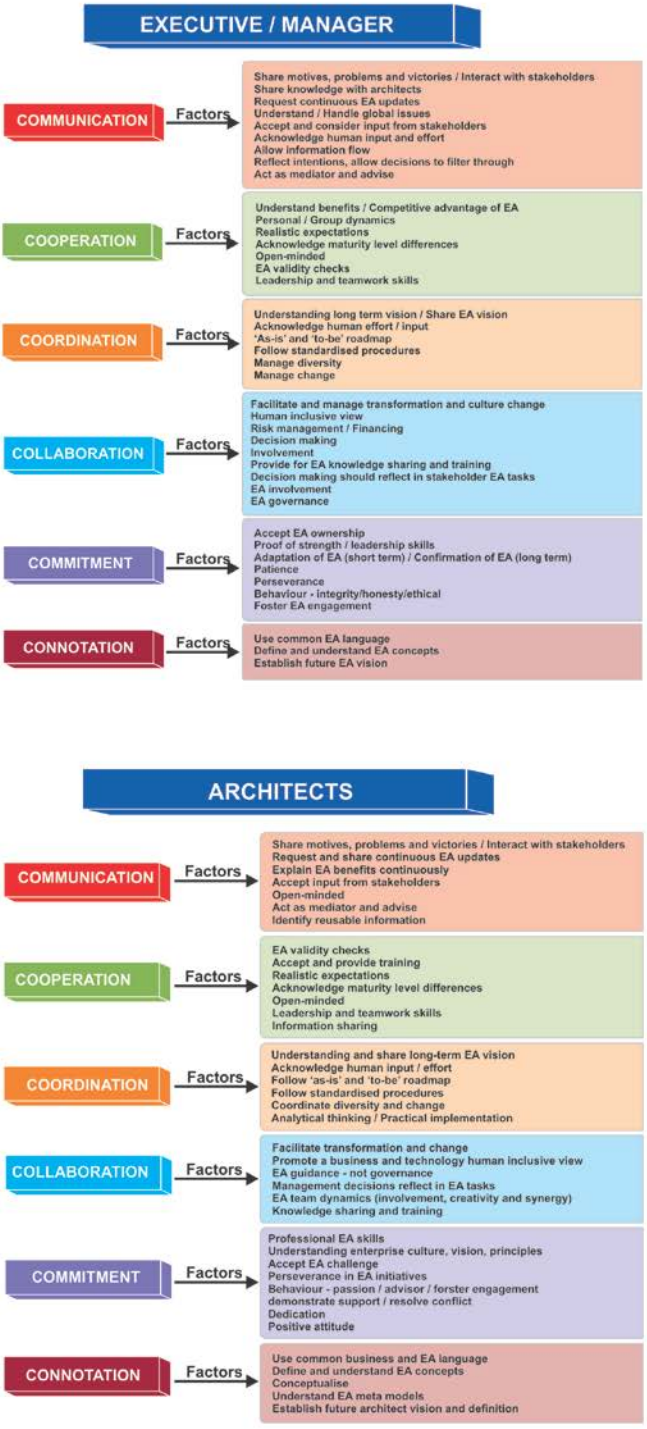


Figure 5.22: WoLAF for EA V1 (1) – Human factors categorised into human concerns mapped to work levels

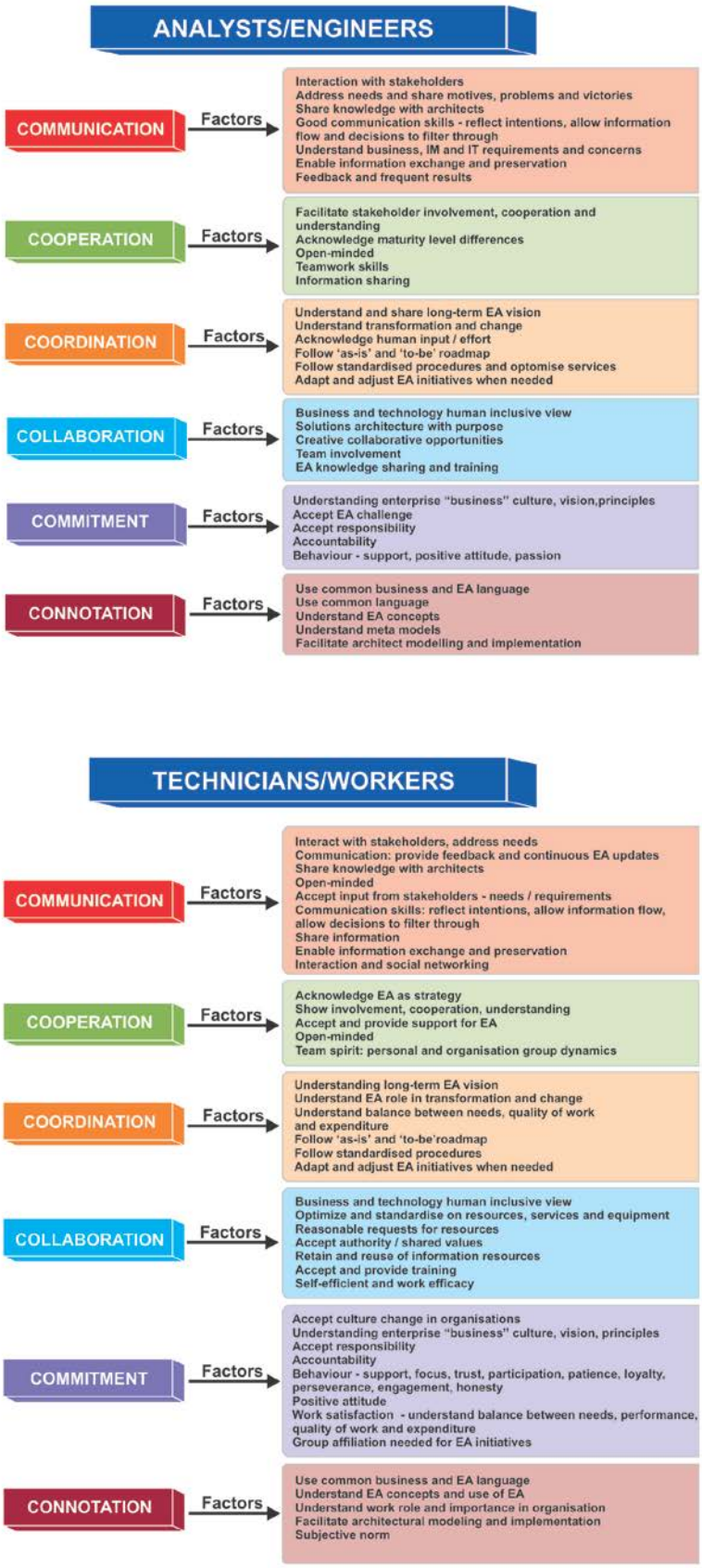


Figure 5.23: WoLAF for EA V1 (2) – Human factors categorised into human concerns mapped to work levels

5.8 SUMMARY

This chapter was used to address research objective 1 (RO1 - *to design a model that will assist organisations in management of EA acceptance*).

Development Phase 1 of the main design research cycle was described where the research and data collection processes to compile the WoLAF for EA Model, were discussed.

In an initial development of a first version of the WoLAF for EA Model (WoLAF for EA Model V1 - a model for the management of EA acceptance), four design research sub-cycles (each cycle representing a design research awareness, suggestion and development phase) were completed:

- An exploratory study was conducted in one South African organisation making use of semi-structured interviews and a focus group interview to identify human factors that could possibly impact on EA acceptance.
- A study of existing literature was compiled to identify additional human factors related to EA and technology acceptance. A combined list of human factors affecting EA acceptance was compiled from the exploratory study (practice) and the literature review (SO1.1).
- Using literature, a classification scheme for human factors was established and the human factors were categorised into a set of human concerns (SO1.3).
- Literature and practice were used to identify work levels applicable to EA and the list of human factors categorised into human concerns was classified into work levels (SO1.2).

The WoLAF for EA Model V1 was compiled after human factors were identified in one organisation. This first version of the model was subsequently evaluated in more contexts than only one organisation to confirm the validity of human factors and work-level categorisation of human factors. Human factors classified into human concerns and categorised into work levels (WoLAF for EA V1) were proved valid and applicable to other contexts. In a final section of Chapter 5 the design and development of the WoLAF for EA Model was explained.