



Kabul University

Ministry of Higher Education
Islamic Republic of Afghanistan

A Reference Architecture for a National e-Learning Infrastructure

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Content

- Introduction
- Research problem
- Motivation
- Objective of the research
- Research methodology
- Result
- Conclusion and future work

Introduction

- This research is about developing e-learning architecture based on NREN
- Currently, around 120 NRENs operate worldwide and provide high-speed communication between educational and research organizations,
- The existing and evolving NRENs offer a good opportunity in academic organizations for e-learning implementation

Research problem

- Researchers did not focused sufficiently on the e-learning architectures for a national level
- Currently researchers mostly focused on application layer and data repository, network layer needs more research.
- E-learning architectures using public networks and public cloud computing are vulnerable to different attacks
- public cloud computing also has limitations of modifiability, interoperability, security and performance
- traditional e-learning system also has problems pertaining to scalability, interoperability, maintainability and security.

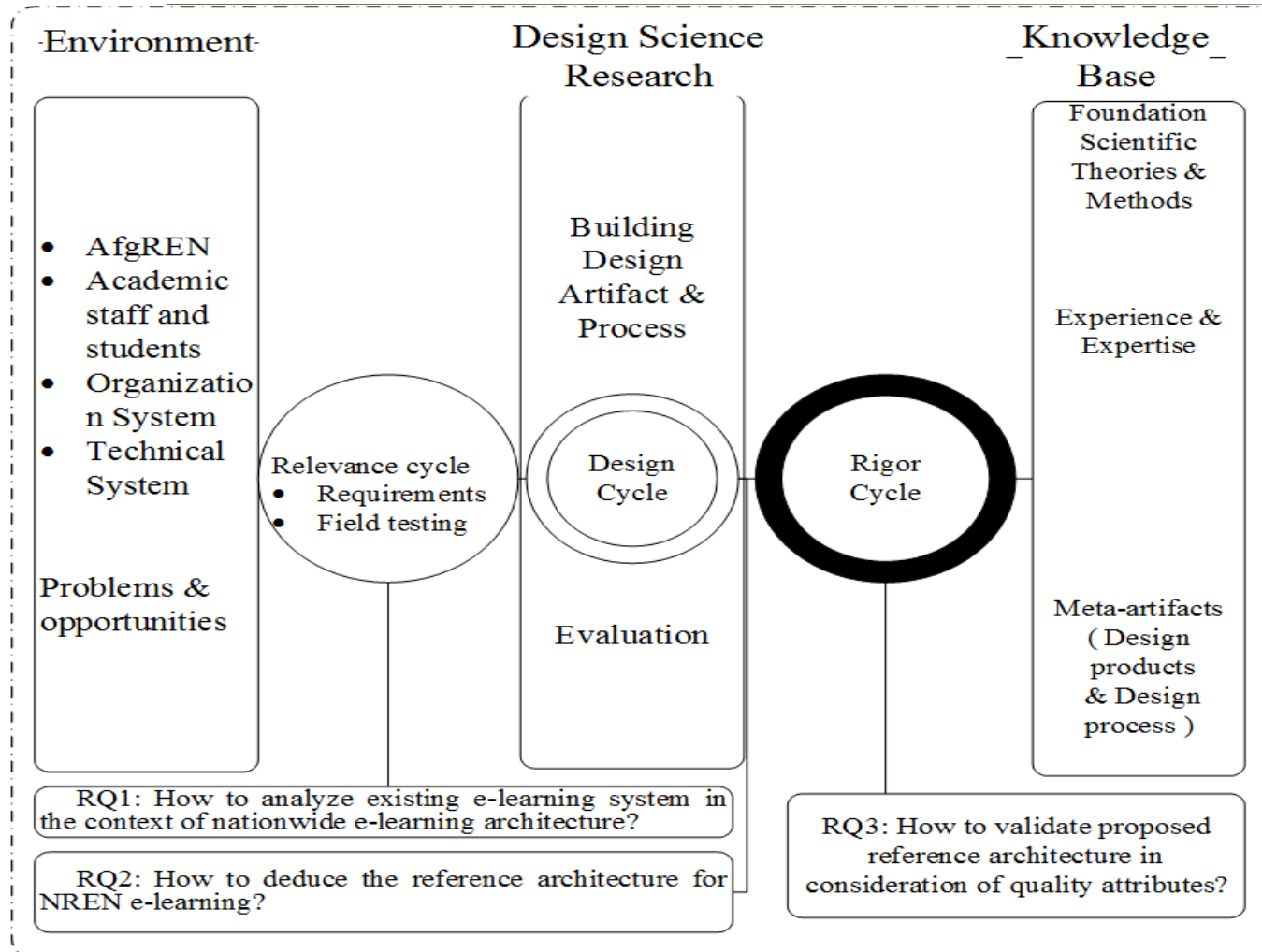
Motivation

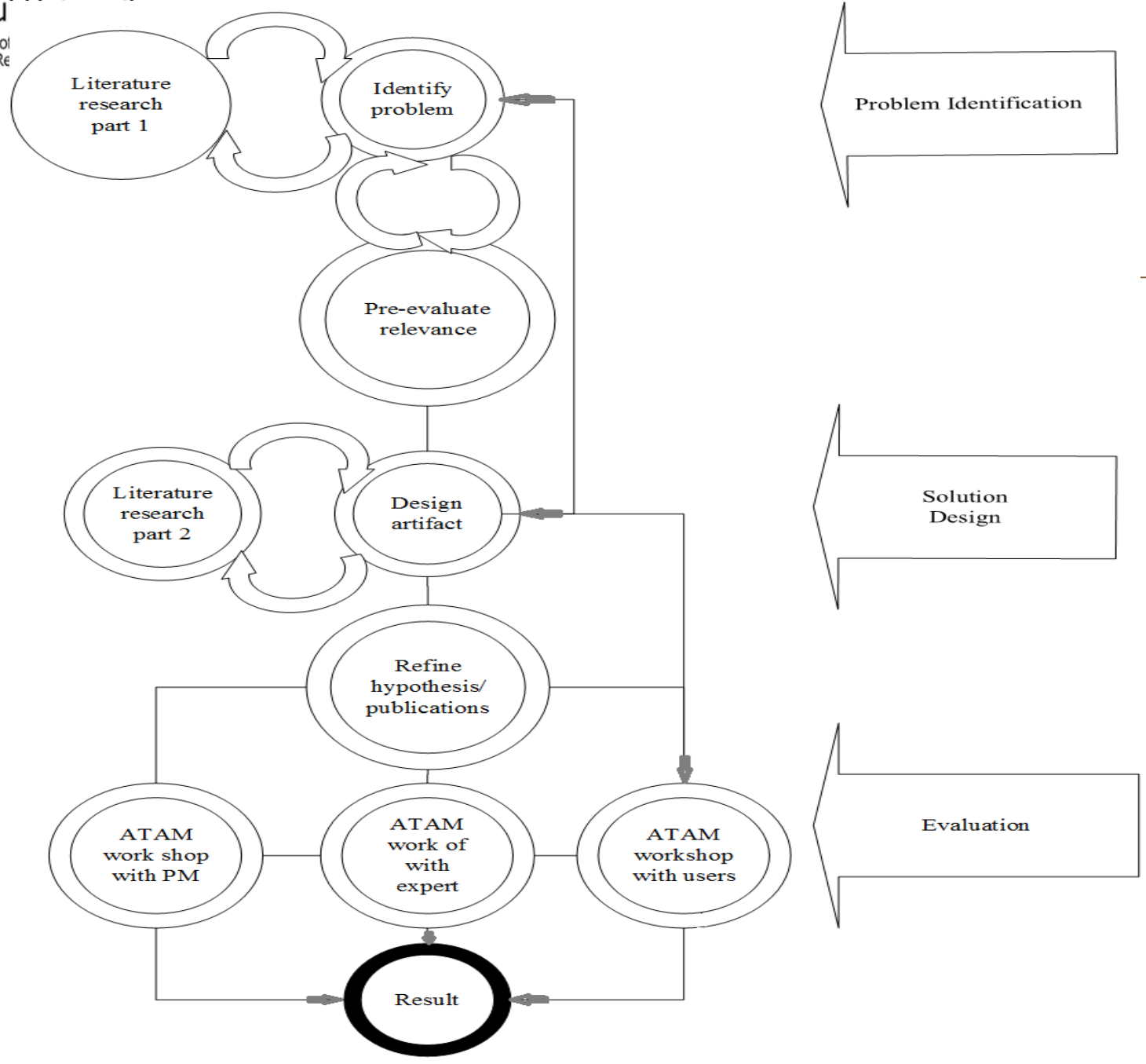
- Existing NRENs are a good infrastructure for e-learning/ but are not using sufficiently as e-learning infrastructure
- It provide a high speed national/ international connection between educational organizations.
- Specially AfgREN are using mostly public services
- NREN is extendable to an educational private cloud computing that can provide PaaS , IaaS and SaaS.
- By considering our expected result, NRENs provide a worldwide collaboration between educational organizations.

Objective

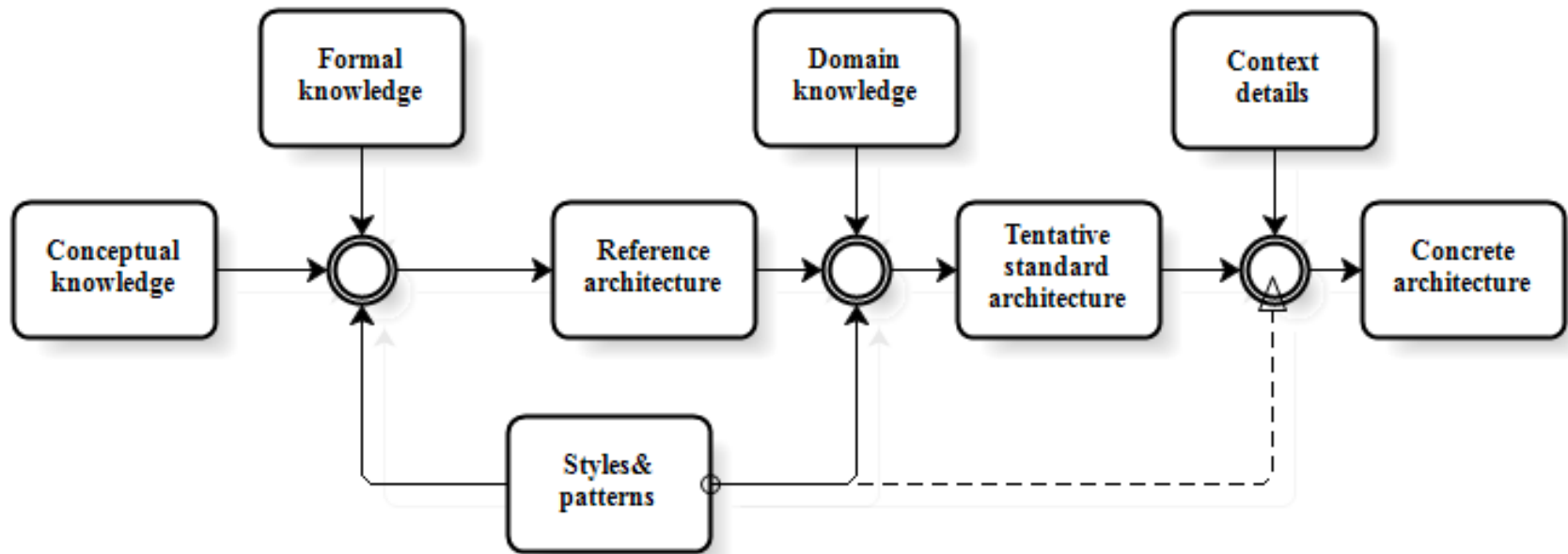
- To provide a national reference architecture
- To solve the problem of Interoperability, integrity and security of e-learning systems based on NREN.
- to systematically design a reference architecture for NREN e-learning deployment with the model driven engineering method.
- To collect, recognize and prioritize the requirements of NREN e-learning architecture.
- To evaluate the proposed architecture based on the quality attributes
- to recognize and prioritize the quality attributes

Research Method

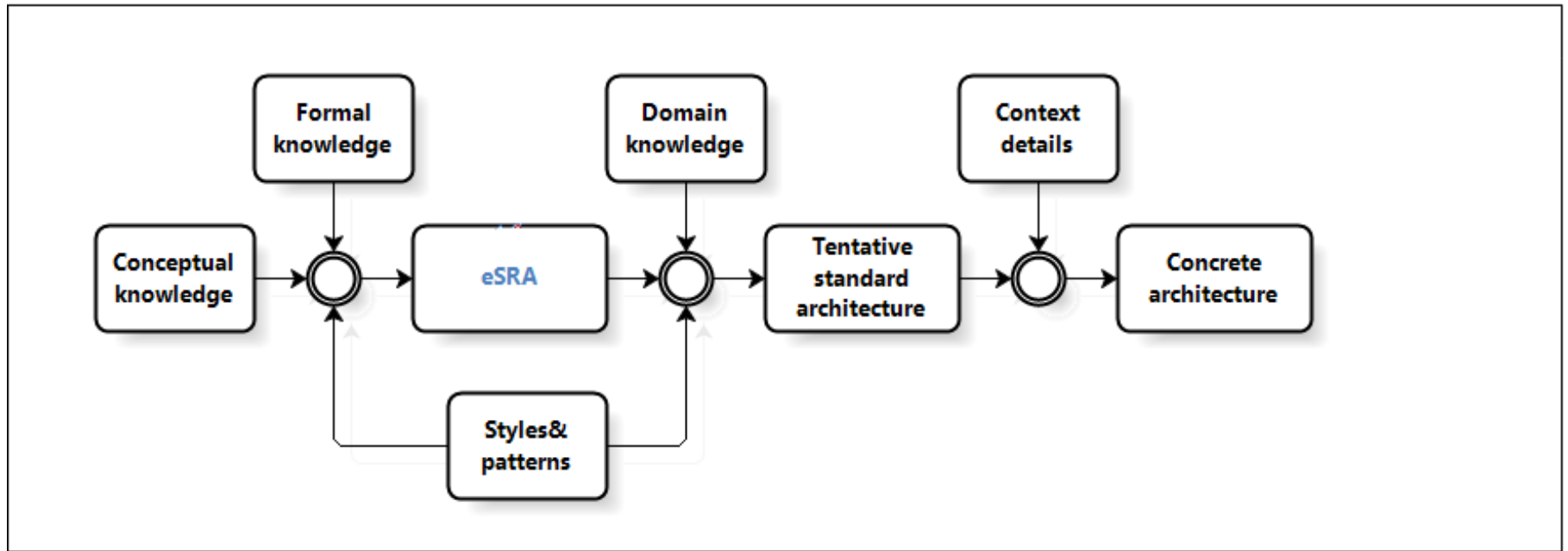




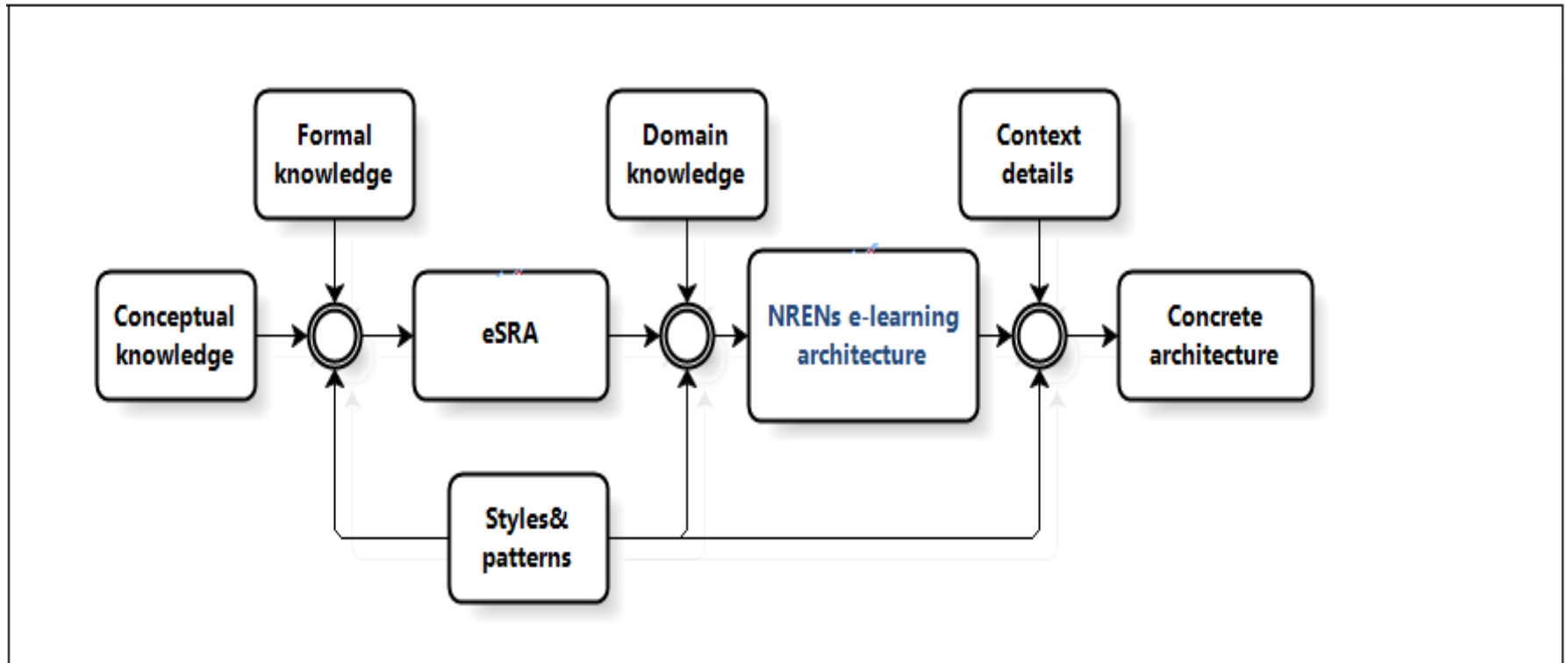
Research Design



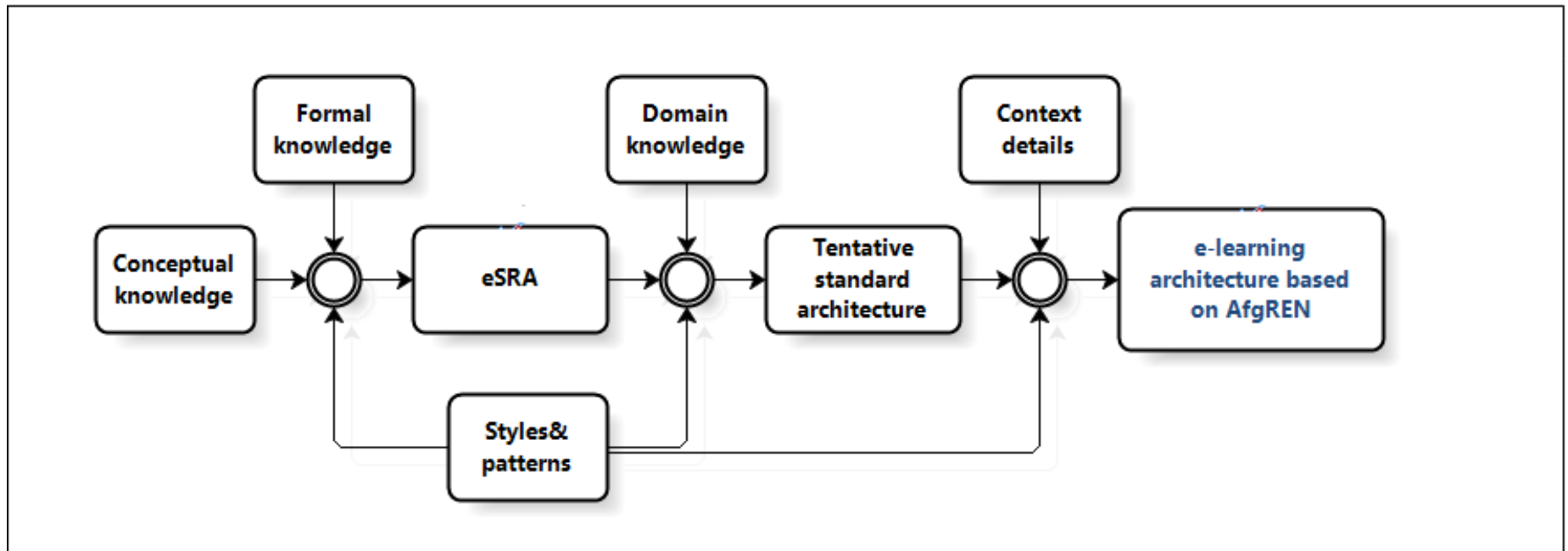
Research Design



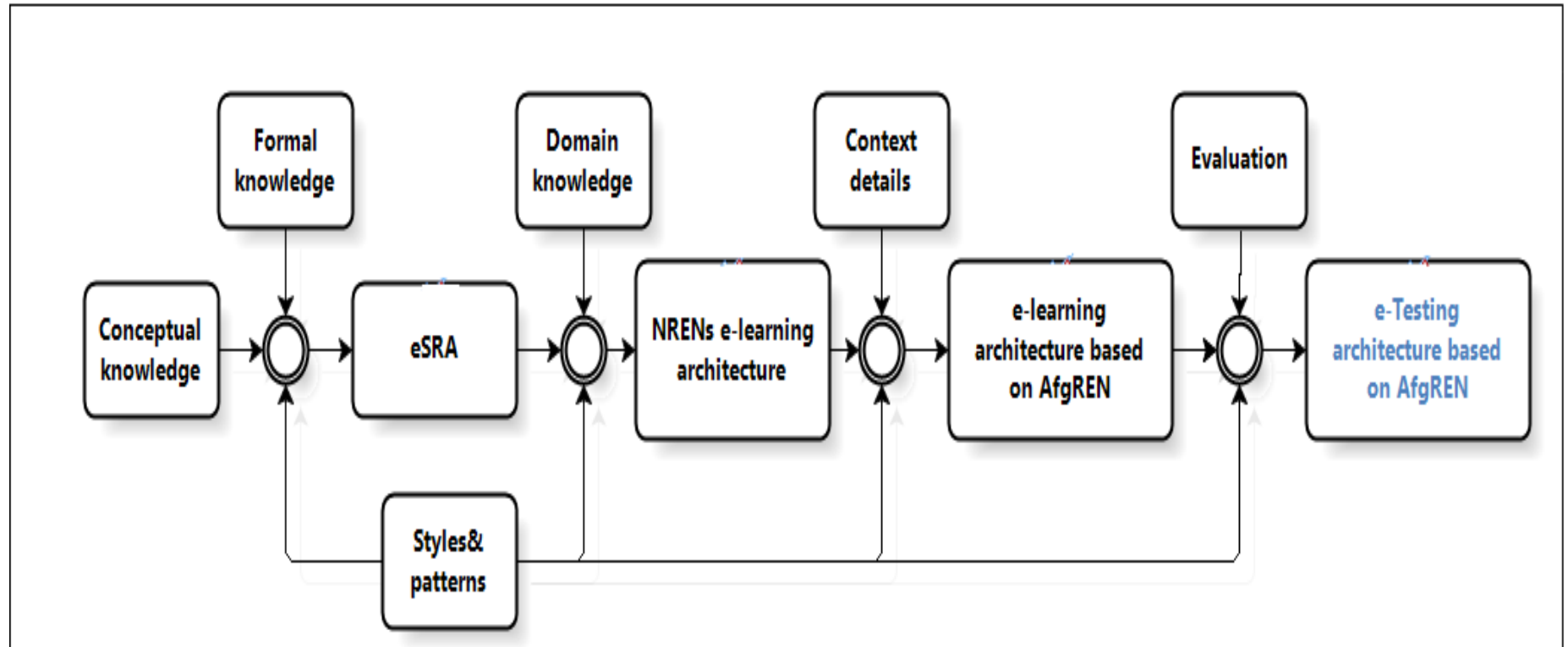
Research Design



Research Design



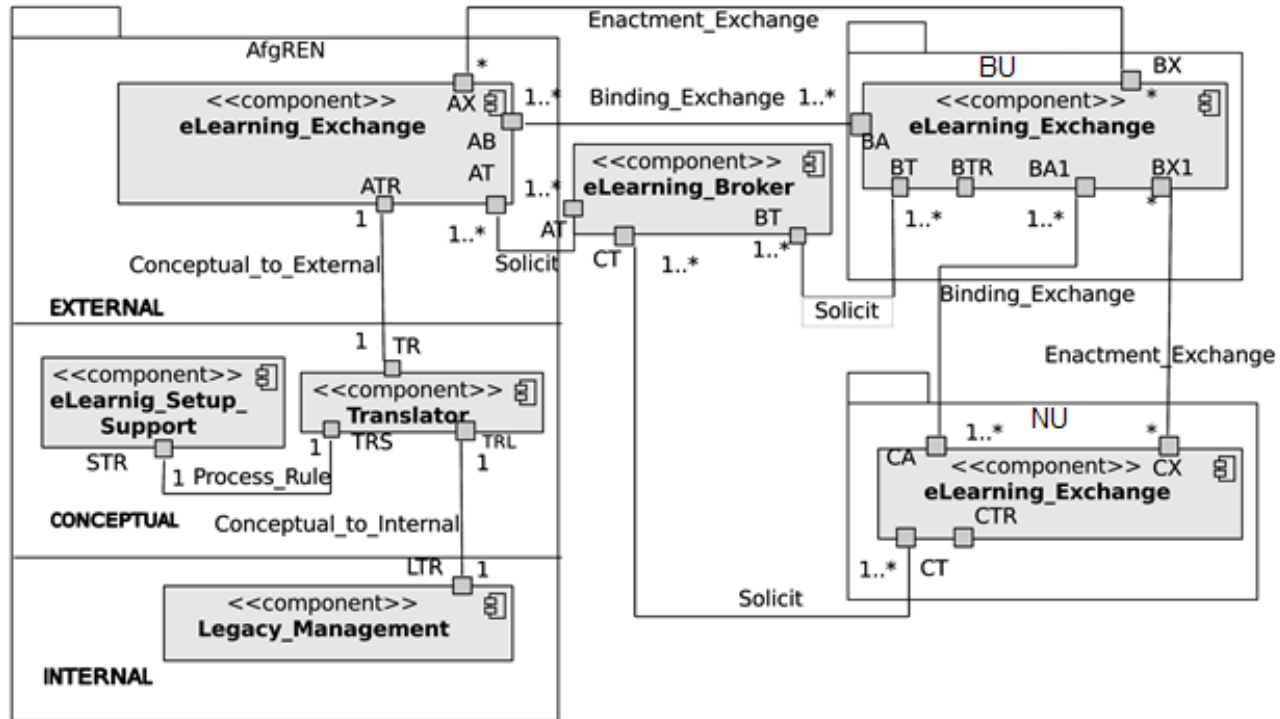
Research Design



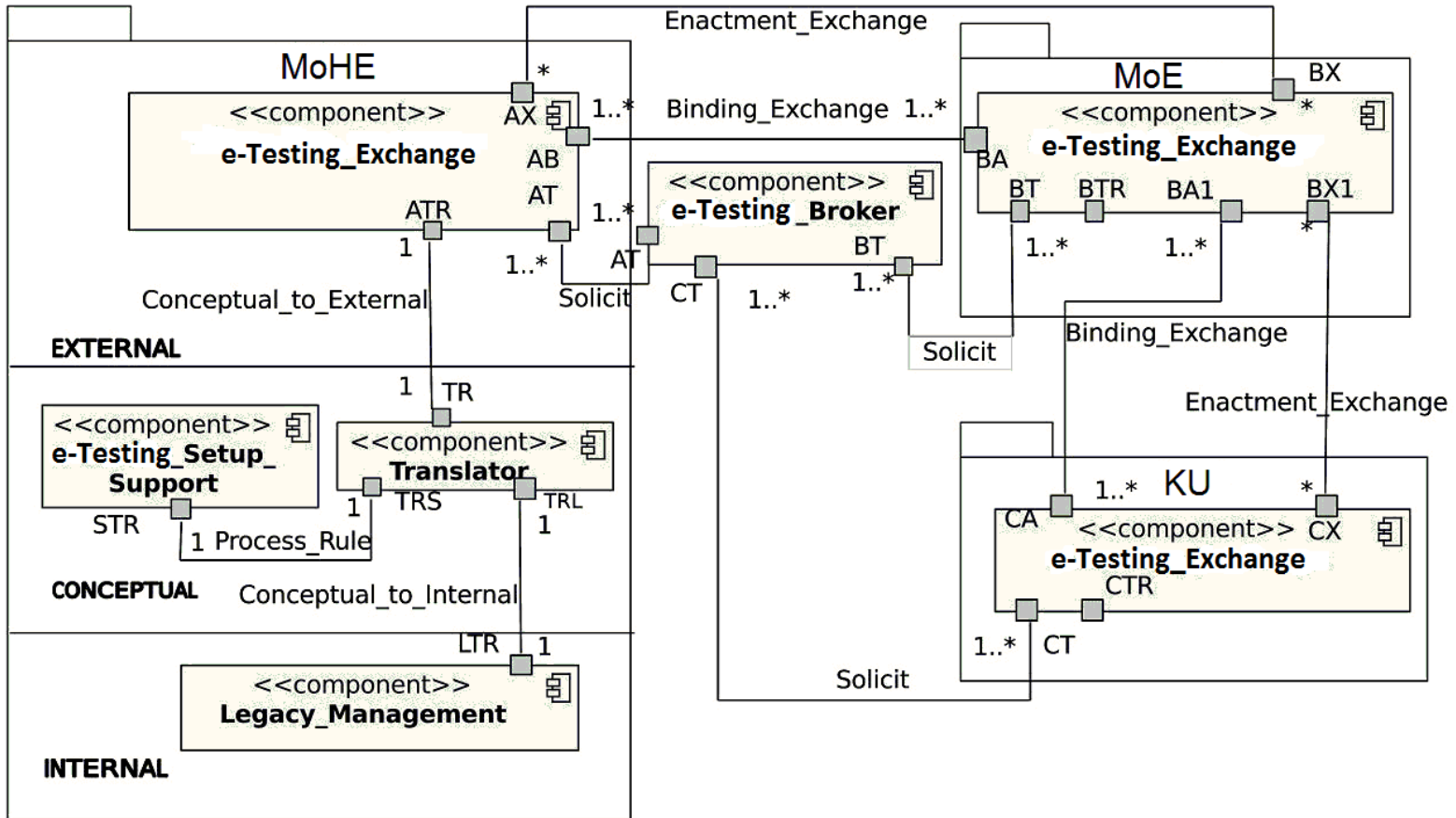


RESULT (scenario 1)

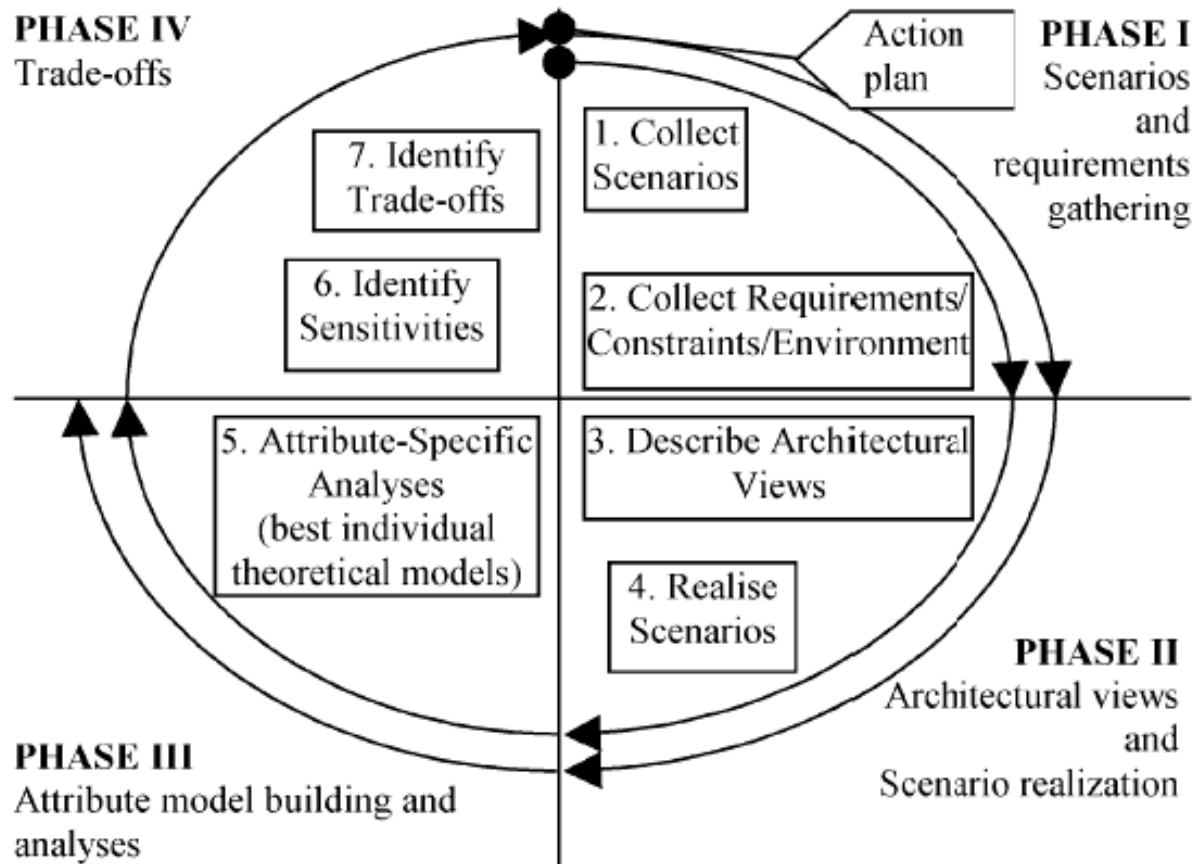
RESULT(scenario 2)



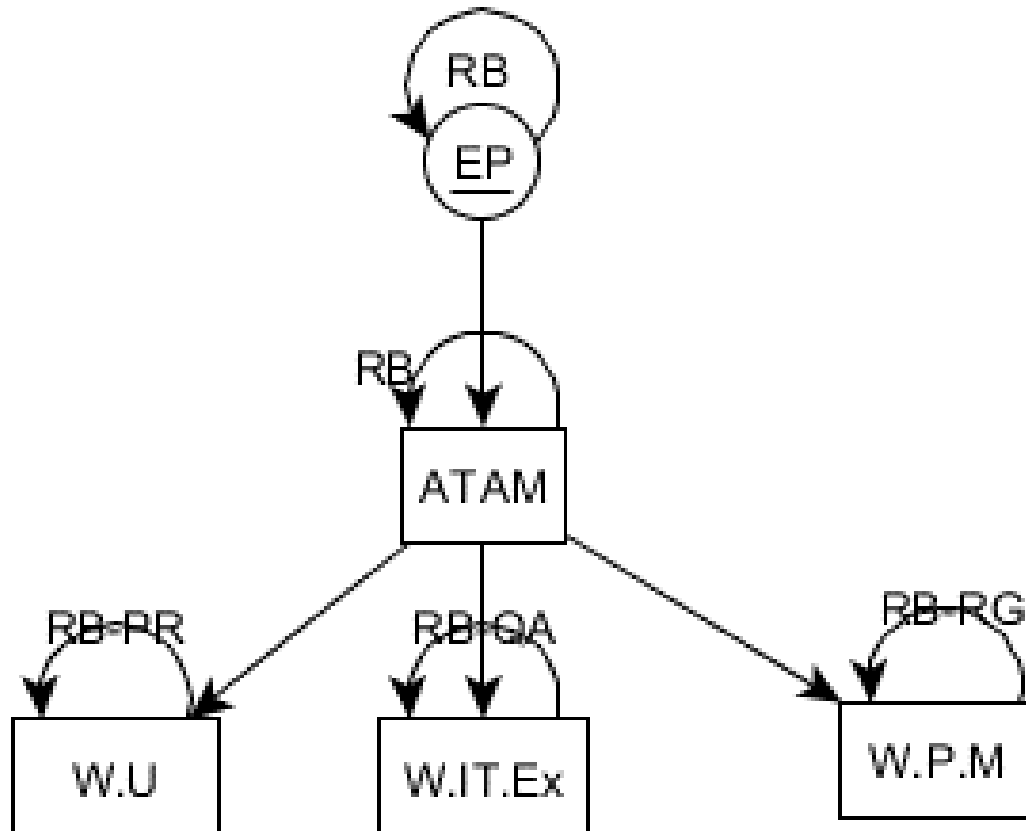
RESULT (scenario 3)



Evaluation (ATAM/ Requirements bazaar)



Evaluation (ATAM/ Requirements bazaar)





Conclusion

- The goal of this research is to design the e-learning based on NREN architecture
- Current e-learning systems including traditional and cloud based has problem of interoperability, data integrity, security, collaboration and high performance.
- We found that concept of eSRA can be adapted to e-learning system, we designed standard architecture and concrete architecture, while it is still a reference architecture based on NREN.
- NREN provide a good infrastructure for e-learning in the national level
- We presented four papers that each of them are a scenario of this research



Future Work

- Developing an e-learning platform based on the proposed e-learning architecture
- Developing a collaboration platform for data exchange between NRENs based on proposed architecture,
- Technology infrastructure architecture,
- Information architecture,
- Application architecture,
- Business architecture.



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Any question

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