On Evolvability Issues of Robotic Process Automation (RPA).

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- Geert Haerens holds a degree in industrial engineering (electricity and automation) and civil engineering (computer science and mechatronics). After having worked for 4 years at the NMBS and 8 years at AB Inbev, he started working for Engie/Electrabel as an IT Architect. In his pursuit for professionalizing the work of the IT Architect, he became a certified EA at the University of Carnegie Mellon and got his Master in Enterprise IT Architect at the Antwerp Management School. In addition to his job at Engie, he is currently doing research at the University of Antwerp on the applicability of the Normalized Systems theory on IT Infrastructure systems.

On Evolvability Issues of Robotic Process Automation (RPA)

By: Geert Haerens

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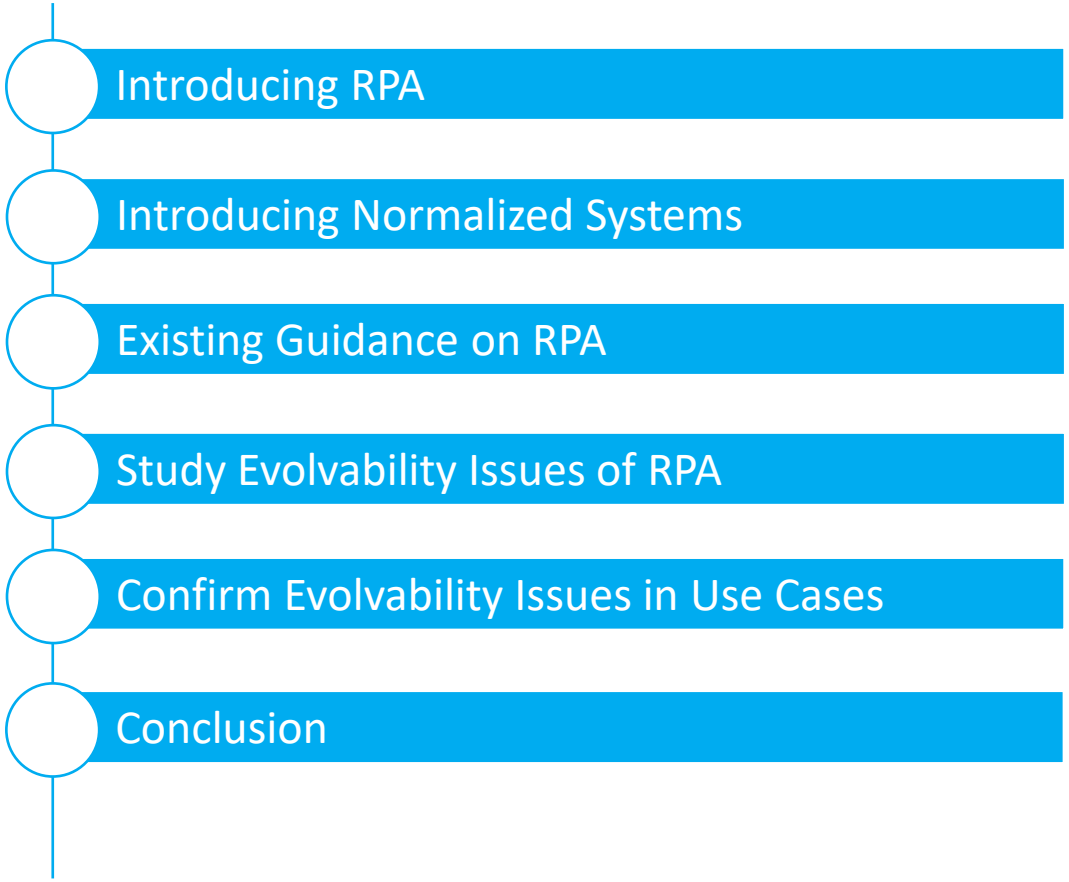
Presentation Content



1

Introducing RPA

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What is it?

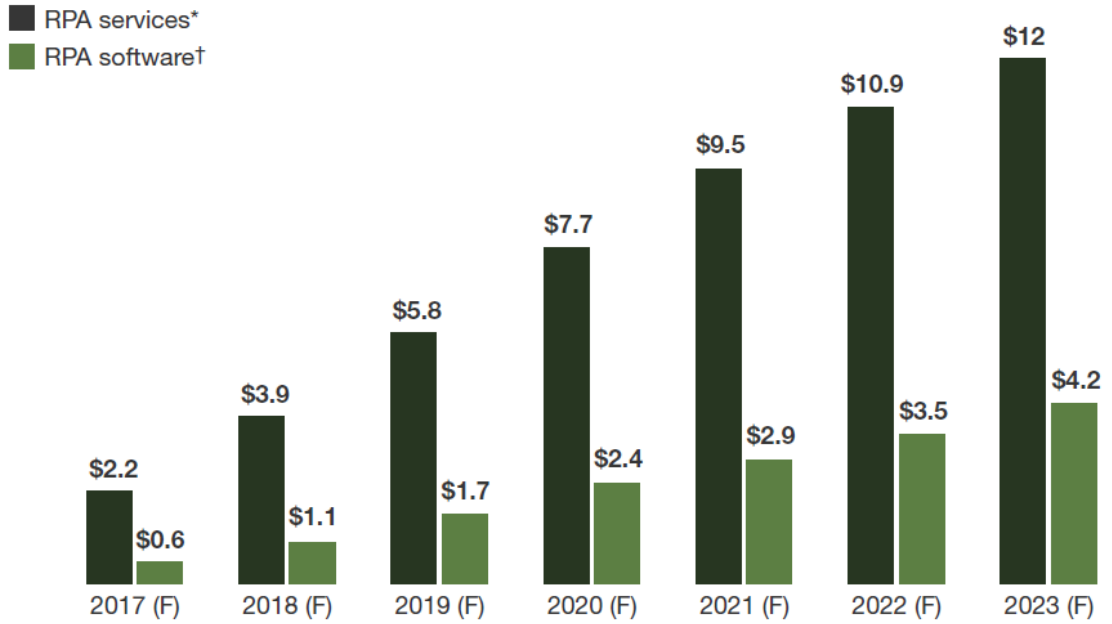
- Robotic Process Automation – RPA.
- Replace repetitive human tasks in a software systems supporting a process, by a software robot – a bot.
- The bot performs all clicks, form fill-ins, as a human would do, based on a pre-programmed script.
- « RPA takes the robot out of the human ».
- RPA is low code.
- RPA leaves the existing systems untouched.
- Cheap.

Introducing RPA

The Business of RPA

- RPA is « Big Business ».
- RPA tooling Market.
- RPA consulting Market.

Robotic process automation software and services markets, 2017 to 2023
(US$ billions)



Base: 5,800 customer deployments of 25 global robotic process automation service providers

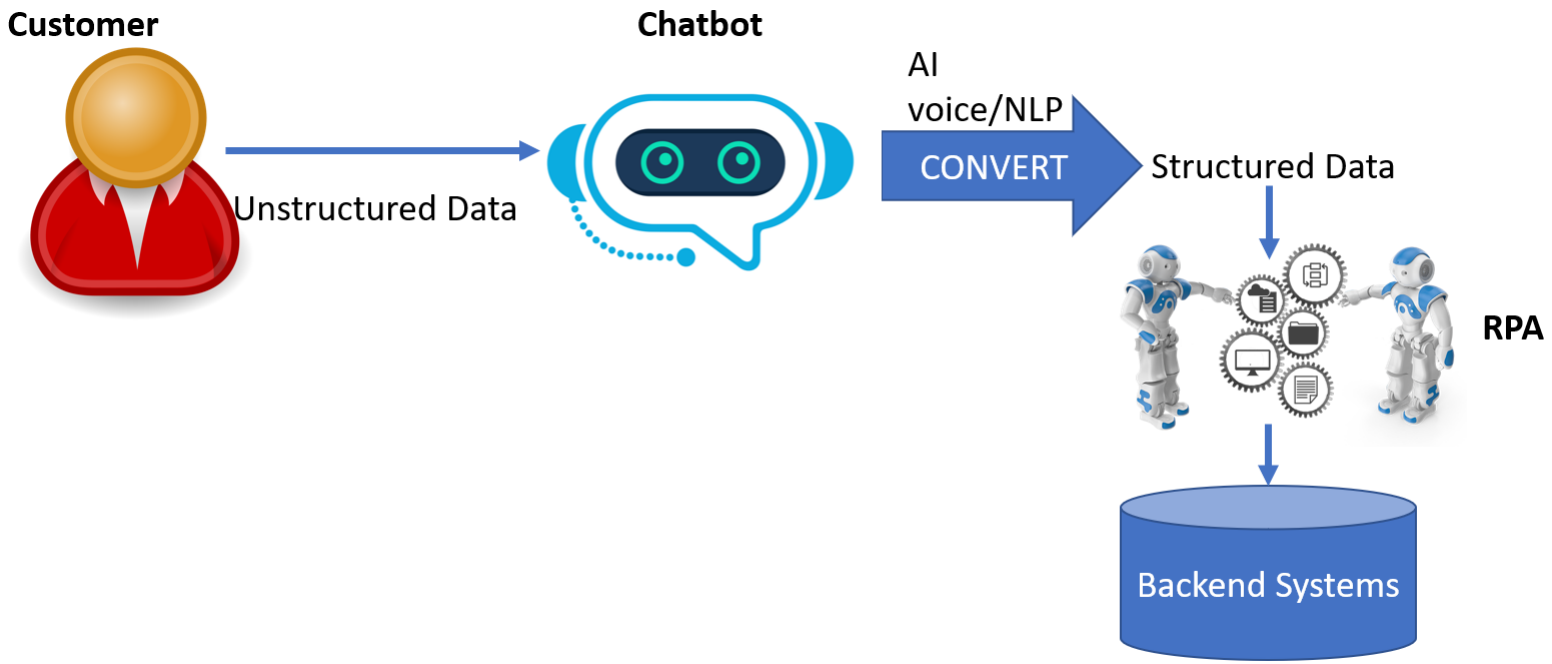
*Source: Forrester's Q2 2019 Global Robotic Process Automation Services Forrester Wave™ Online Survey

†Source: Forrester's Q1 2017 Global Robotic Process Automation Forrester Wave™ Online Survey

Introducing RPA

The Usage and Future of RPA

- Popular for Back-End processes
- Combining AI chatbots and RPA



2

Introducing Normalized Systems

Introducing Normalized Systems

What is it about?

- Studies the evolvability of modular software systems.
- Defines 4 theorems as the necessary conditions a modular structure must adhere to, for evolvability.
- A systems is considered evolvable when it is stable under change.
- Stable under changes = Bounded input leads to Bounded output.

- A limited functional change (bounded input) must lead to a limited change in software modules (bounded output).
- If not, a Combinatorial Effect is observed: change is proportional to the system itself.

Introducing Normalized Systems

Relevance for RPA

- RPA is part of a systems
- A system can be represented by its components.
- Those components can be looked at as modules.
- Normalized Systems can thus be used to study evolvability.
- A bounded change to the system - to the process - must result in a bounded change in the components making up the system.

- Necessary Conditions @ Design:
  - SoC: Separation of Concern → Concern = a change driver
  - SoS: Separation of State
  - AvT: Action Version Transparency
  - DvT: Data Version Transparency

Introducing Normalized Systems

Relevance for RPA

- Necessary Condition @ Runtime:
  - Instance Traceability
- Based on Statistical Entropy

$$\frac{\text{Number of Micro-states}}{\text{A Macro-state}}$$

- Example: 3 dice – you role 9 – 9 is the Macrostate – the number of possible combination of dice leading to 9 is the Micro-state (R1, B2, G6 – R2, B1, R2, G6 – etc)

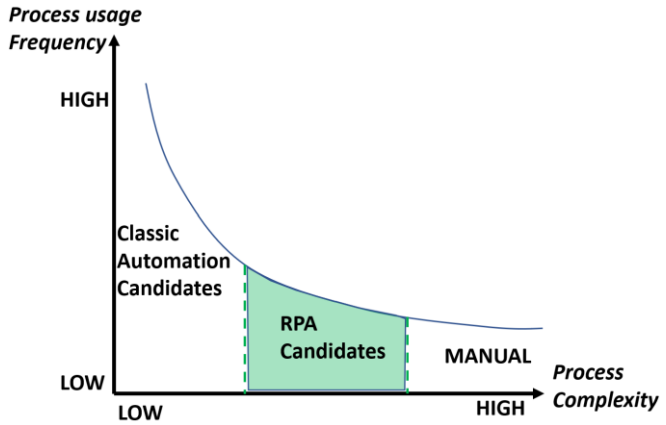
- Instance Traceability: you must know the Micro-states, or you can't link it to a Macro-state.

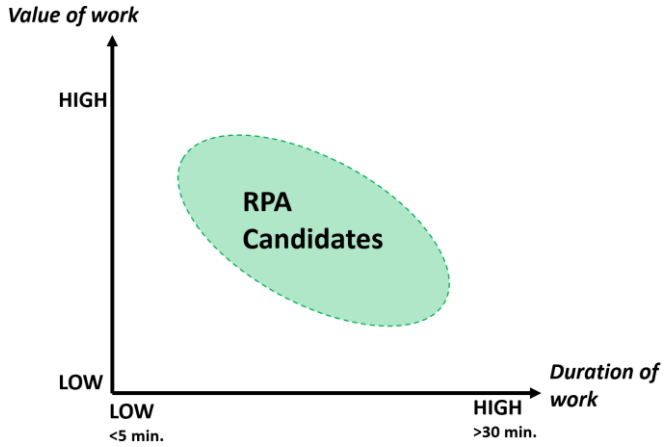
3

Existing Guidance on RPA

Existing Guidance on RPA

- Forrester: « The Rule of 5 »
  - Max 5 decisions
  - Max 5 applications
  - Max 500 clicks
- Literature:
  - Low cognitive requirements
  - Access to multiple systems not required
  - High volume
  - High probability of human error
  - Limited exception handling
- Evolvability not handled in the literature



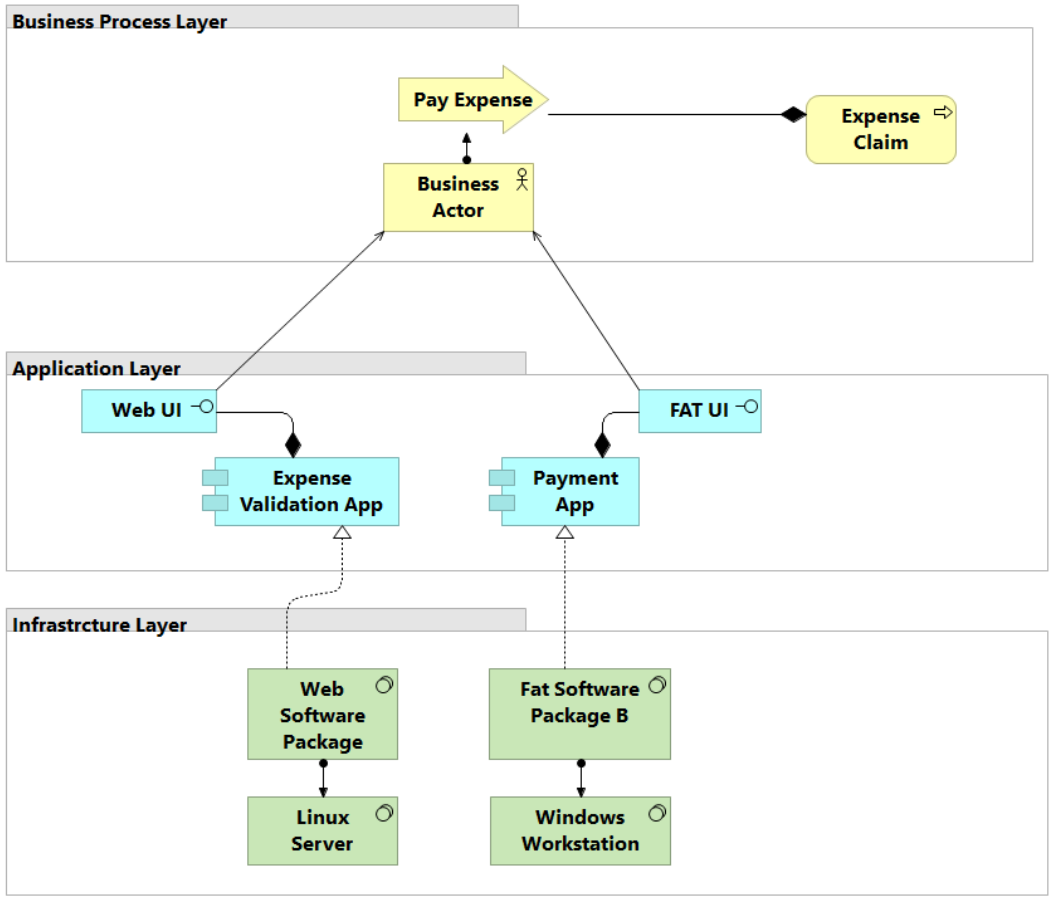


4

Study Evolvability of RPA

Study Evolvability of RPA

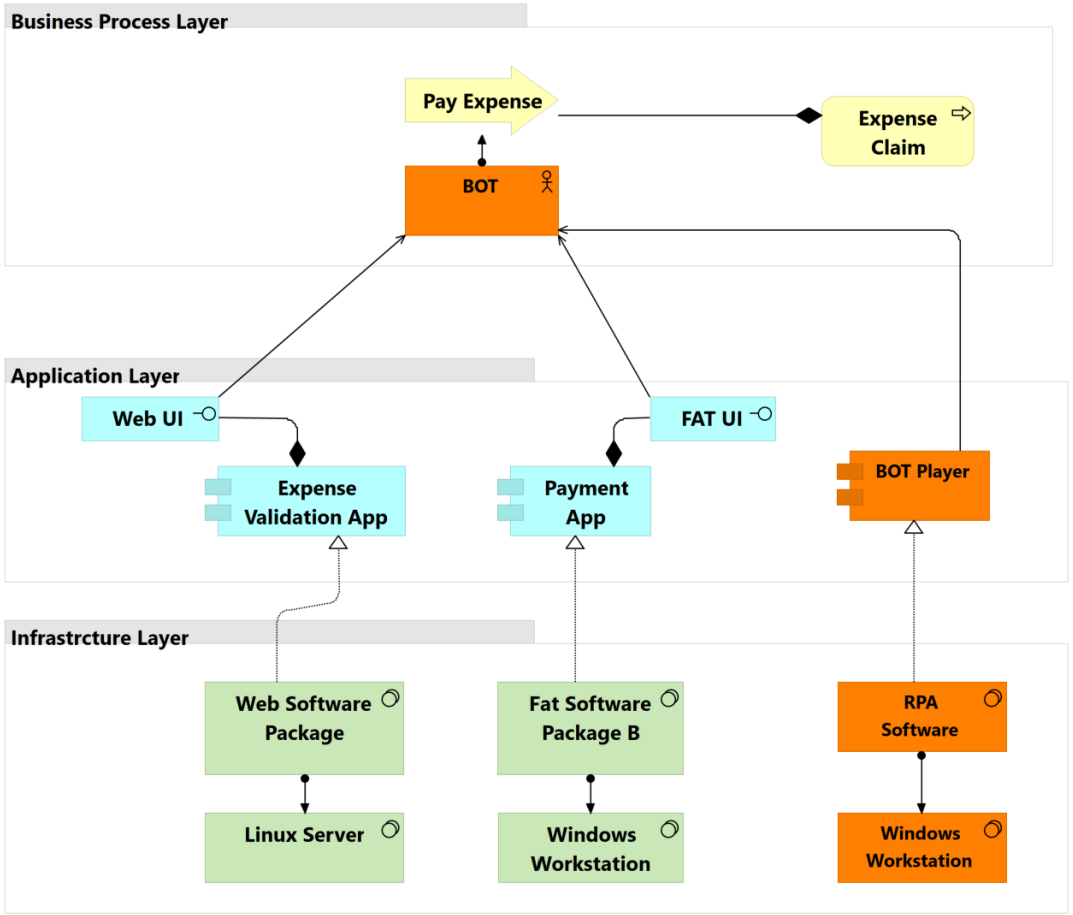
A simple Expense Claim process – without RPA



Study Evolvability of RPA

A simple Expense Claim process – with RPA

- Change can and will ripple in all directions.
  - process changes
  - Application changes
  - Infrastructure changes
  - RPA environment changes
- Combinatorial Effects will happen.
- Violation of Separation of Concerns.
  - All changes drivers thought the GUI.
- Violation of Instance Traceability
  - The robot sits at the outer edge of the system.
  - Only observing the Macro-state.



Study Evolvability of RPA

Counteracting the effect of change

- RPA tool vendors claim to use AI to counteract the effect of changes
  - Use AI to counteract screen layout and visual element: Not AI !
  - Machine Learning, Deep Learning to detect changes:
    - How?
    - There is no Instance Traceability.
    - AI required Instance Traceability to detect Macro-states that are linked Micro-states.
  - Integrate with applications
    - No longer RPA but Business Process Automation

5

Confirm Evolvability Issues in Use Cases

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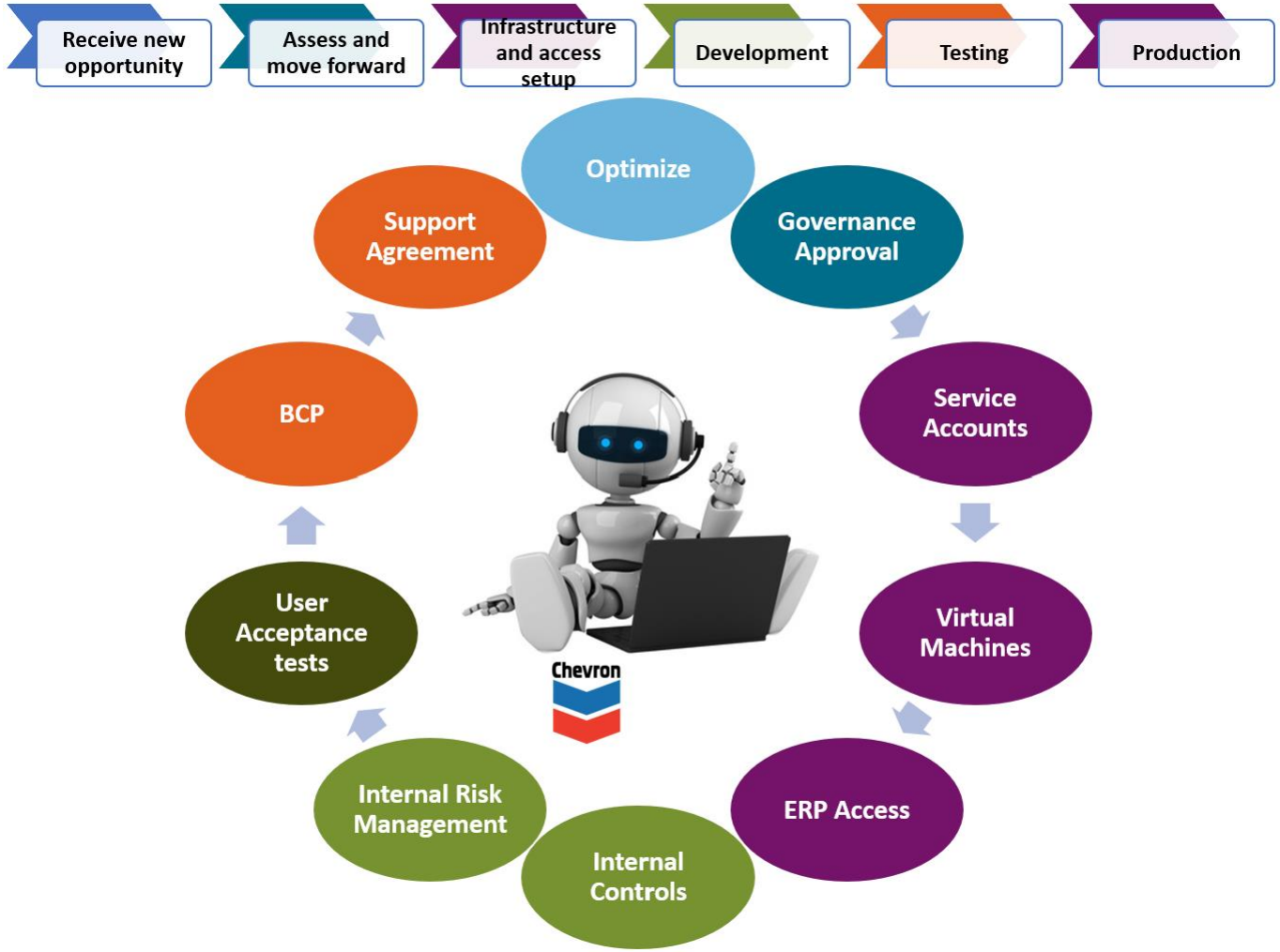
Confirm Evolvability Issues in Use Cases

Chevron

- Know the process. Easier said then done.
- Involve Risk Management.
- Have BCP – Business Continuity Plan in place, when the bot fails.
- Confirmes the « fragility » of the infrastructure.
- Watch out of unforeseen changes (?)



Confirm Evolvability Issues in Use Cases

Engie IT RPA team

- Confirms the evolvability analysis.
- Sees business wanting to apply RPA on non-suited cases.
- Struggles with having solid decision rules on « TO RPA or NOT TO RPA »
- Sees benefits of using RPA in data migration scenarios.

Conclusion

Conclusion

- RPA has evolvability issues, by Design!
- Has been confirmed by Normalized Systems based analysis.
- The topic of evolvability is insufficiently handled in literature and by the industry.
- Be sceptical about AI going to compensate for the evolvability issues.
- If you want to use it, only choose stable processes (look at the full system) or RPA cases generating a fast ROI.
- On all other cases: « Stay away from RPA »

THANK YOU !

Feedback? Comments?
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