Interaction Room for Cloud Migration (IR:CM): A Systematic Approach

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Abstract: Cloud migration is by now an established discipline that is dominated by different methods and frameworks from vendors of commercial offerings. However, it may be hard for teams to discern the inherent risks of such offerings, which may appear as biased tool support, and design processes that cannot be tailored to the needs of the enterprise (and rather have to fit the requirements of the cloud provider). We analyzed these solutions and propose a new method that combines the strong points of the existing designs while overcoming their weaknesses. Our method design results in adaptation of the proven interaction room method to the field of cloud migration (IR:CM). We focus on communication among all stakeholders, identifying risks and challenges, defining scope, and prioritizing requirements, to guide teams while designing cloud-native solutions that are flexible to the changing needs of the business. The new method itself has been developed following the Design Science Research paradigm.

1 INTRODUCTION

Cloud is one of the most progressively growing and demanded technologies. It has the ability to transform conventional business models and accelerate businesses to greater extents towards becoming agile, cost-efficient, and innovative. Thus, cloud migration is now at the center of attention for most organizations that still rely on inefficient legacy systems, have high infrastructure costs, face end-of-life concerns, etc. However, it is a complex process with considerable challenges, that requires mindful analysis and planning to ensure that the process itself adheres to the original requirements and goes in line with defined objectives. Therefore, while cloud migration brings benefits, it comes with challenges that organizations must overcome. Migrating to the cloud is a complex process if to-be-migrated systems have accumulated a large amount of data over time and have been in operation for many years, possibly with different integrated components and dependencies, which could also be resource-intensive. Cloud migration can also be disruptive for business operations, potentially requiring temporary system downtime, which can impact productivity.

For these reasons, the migration process requires a methodical approach, as suggested by notable previous research (Babar, 2013; Zhao and Zhou, 2014; Mohagheghi and Sæther, 2011). A well-defined approach assists organizations to perform an effective and safe migration to the cloud, instead of an ad-hoc migration effort which may cause troubles and have poor results and undesired effects on the business. Without methodical guidance, organizations run the risk of poor outcomes and errors which could otherwise be avoided. A well-structured approach considers the specific needs of the organization and can include steps such as: assessing the current state of the legacy systems, identifying the specific data and functionality that needs to be migrated, evaluating the available cloud platform options, and developing a detailed migration plan.

The Interaction Room Method (Book et al., 2012) is a way to effectively manage complex software development projects by identifying key value drivers, risks, and obstacles early on, and by facilitating cooperation among project stakeholders. It allows for achieving quick progress in planning and analysis through the use of workshop-based concepts. The method is based on the idea that understanding and

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communication are crucial for successful projects, and it can be used in a variety of situations, including emergencies, general process improvement, and digitalization efforts.

In this paper, we introduce a method of this kind, namely the Interaction Room for Cloud Migration (IR:CM). We follow the Tool for Developing and Evaluating Methods (TDEM) proposed in (Huseynli et al., 2022) to develop the IR:CM method scientifically, following method design theories. This method allows smooth analysis and planning of cloud migration activities by putting emphasis on communication among all stakeholders, to promote the fulfilment of critical aspects, such as providing intuitive early identification of risks and challenges, defining goals and scopes, and concretizing and prioritizing requirements.

2 PRIOR RESEARCH

(Grapenthin et al., 2013) applies the Interaction Room in a large systems evolution project at a German insurance company to foster stakeholders' understanding of the risks and dependencies that the project may have, by specifically addressing the issue of expert knowledge lacking methodical experience, and method experts lacking business experience.
(Jamshidi et al., 2013) identifies and systematically compares existing research on cloud migration and states that there is a need for migration frameworks and tool support to improve the maturity level and trust for the cloud, as well as the need for architectural adaptation and possibly self-adaptive cloud-enabled systems. Therefore, Jamshidi et al. (2013) develop the Cloud Reference Migration Model (Cloud-RMM). Cloud-RMM consists of four migration phases, which are *planning*, *execution*, *evaluation*, and *crosscutting concerns*. In particular, the migration planning phase involves tasks such as feasibility study, requirements analysis, selection of providers and services, and migration strategies. The output artefact of this phase is a migration plan.
(Bazi et al., 2017) introduces a comprehensive cloud migration framework for managers to facilitate the migration process and ensure effective migration to a cloud computing environment.
(Fahmideh et al., 2016) notices that there is no existing overarching view of cloud migration processes and proposes a platform-independent metamodel, which encompasses phases and activities for cloud migration. (Grapenthin et al., 2015) introduces the Interaction Room method to an agile team in a medium-sized software development company, and it results in better communication among all project stakeholders with a more reliable identification of the tasks.
(Jamshidi et al., 2017) develops V-PAM (Variability-based, Pattern-driven Architecture Migration), a migration method meant for multi-cloud environments, that involves cloud architecture migration patterns and situational context. This method helps select relevant migration patterns and build a migration plan using them.

During our research, we also profoundly studied commercial cloud migration methods from different cloud vendors, and we found that existing methods have room for improvement on the following fronts:

1. Customization: compared to similar methods from hyperscalers, we saw several areas where those methods needed to be improved jointly. In all cases, a cloud migration journey for each customer is unique; thus, a method should have real-life interaction, making the journey tailored for each given customer. Using frameworks by hyperscalers can help define an ideal target picture and a good set of baseline capabilities to achieve; however, we firmly believe that the cloud journey should be customized in all cases. Each customer has different opportunities, challenges, and goals, and a cloud migration method must consider them through real-life interaction. Real-life interaction is important because it brings up information otherwise unobtainable through formal channels/questionnaires.

2. Not endorsing cloud vendor-agnostic approaches: in some cases, it is worth making a cloud provider-agnostic architectural decision, but understandably options leading to that direction are not always highlighted or endorsed in the frameworks prepared by said cloud vendors. Therefore, we sought a method that leaves room for finding a balanced approach between being fully vendor-native and completely vendor-agnostic in such decisions. This is achieved on a per-application basis (incl. run-time, integration layers, etc.).

3. Support both traditional and agile approaches: despite the proven good reputation of agile approaches, not all organizations are open to such modernization. However, an agile environment should be cultivated to truly achieve the benefits of the cloud. When a method only works well in an already agile environment, it excludes those customers who are not yet there. Thus, a method supporting traditional (e.g., waterfall-based) organizations must exist and allow them to gradually convert.

4. Providing value quickly: the method shall produce an output that can be used immediately as a starting point for the next steps. Therefore, we implemented *Microsoft*'s approach of the 'power of 10': at the end of the interaction, several applications ideal for cloud migration are selected, and their modernization paths are paved on a high level. Thus, the first migration can be achieved in weeks, and there is always an ordered backlog of migration tasks to focus on. In combination with a roadmap, this work item serves as a compass during the migration.

5. Deferring cloud vendor selection: Our method can defer the cloud provider selection, as long as it is advised. This is useful because some providers are better suited than others for specific profiles. Capabilities do not always match, but best practices align amongst cloud vendors. Thus, we can defer selection as long as it is recommended (however, we realize that, in most cases, the cloud vendor is already selected well before starting the migration process).

These five principles were the main goals when designing the Interaction Room for Cloud Migration.

3 RESEARCH METHOD

We developed our method using the Design Science Research (DSR) paradigm (Hevner et al., 2004; Peffers et al., 2007; Offermann et al., 2009). DSR involves developing new artefacts, constructs, models, methods, or instantiations to address organizational information systems/technology problems. In our research, we follow the DSR process proposed by (Offermann et al., 2009), which defines the three main phases "problem identification", "solution design", and "evaluation". We conducted said phases in one iteration. Problem Identification – the proposed method is addressing an important and timely problem related to cloud migration projects. There is a lack of method and tool support for the preparation stage of cloud migration, and our proposed method helps properly analyze and plan the project, resulting in a process map and summary/backlog of the first set of to-be-migrated applications. Solution Design – we design our artefact using concepts based on the interaction room method (Book et al., 2012) and design thinking exercises. To describe the method, we use the TDEM (Huseynli et al., 2022) to see if the proposed method is relevant from the perspective of method design theories. Evaluation – the proposed method has been evaluated in the context of a real-world project within an organization, with independent components in mind. The complete integration of such components, as suggested in this paper, will be further evaluated in future research. The method we introduce herein fulfils all the seven guidelines for Design Science Research as formulated by (Hevner et al., 2004).

In the solution design phase as pointed out earlier, the central artefact in this research is a method and we are constructing it using the scientific approach known as Method Engineering. Method Engineering has been first introduced by (Brinkkemper, 1996) and described as the engineering discipline of designing, constructing, and adapting methods, techniques, and tools for the development of information systems. (Bucher and Winter, 2008) also further complemented that a method is a solution that consists of design activities executed by specific roles in a specific order, applying specific techniques, and producing design outcomes as results. We conduct method engineering by first looking into existing methods in the literature and discovering, selecting, tailoring, and integrating method components. Looking further into existing literature, we find several existing methods encompassing various purposes which we outlined in the section 2.

As seen from section 2, none of the previous research efforts introduces a method for cloud migration projects that specifically considers ease of communication among stakeholders, brainstorming with design thinking exercises, illustrating the creation of migration plans with the power of design thinking exercises, and encourages idea sharing and identifying activities with the help of an Interaction Room Method, even before the execution of the cloud migration. All of these designs such as (Amazon, 2022; Google, 2023; Microsoft, 2019) have advantages and disadvantages. We analyzed the designs and proposed a synthesized design that combines the strong points of the existing designs while overcoming their weaknesses. Furthermore, the concepts and theories used in the state-of-the-art have been adopted in our research to construct the method. The method components we considered for the construction of our method are: the Interaction Room Method, the AWS (Amazon, 2022) 7R migration strategy, the Microsoft (Microsoft, 2019) guide for selecting the first N to-be-migrated applications and design thinking exercises.

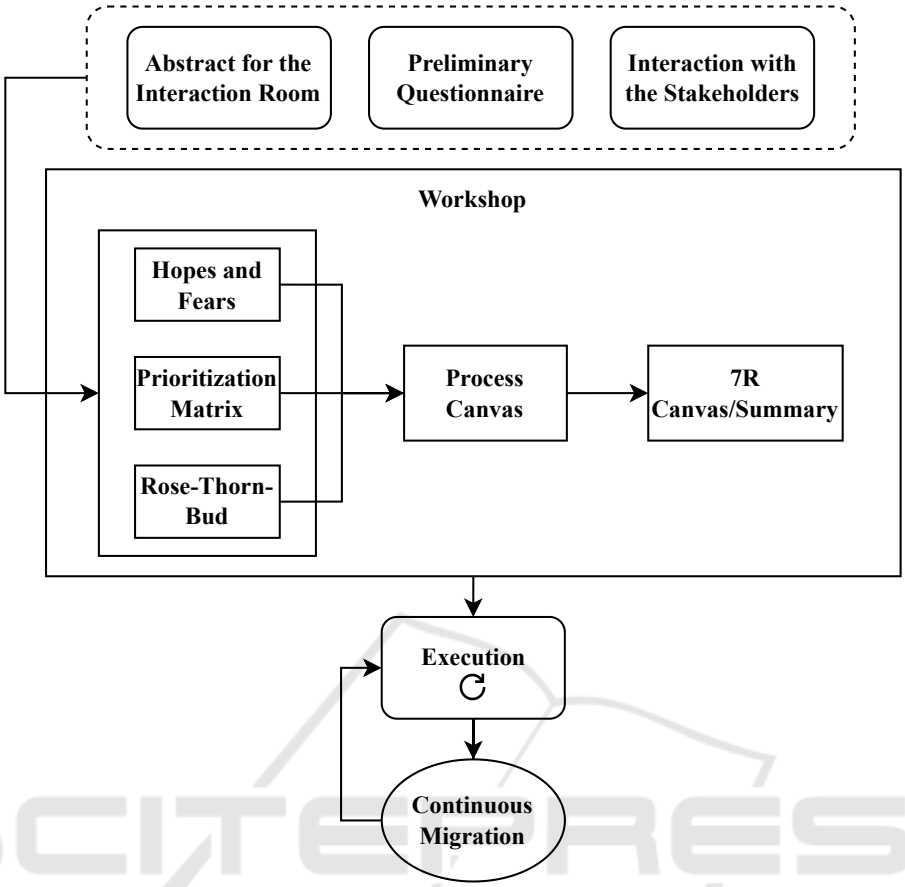

Figure 1: Interaction Room for Cloud Migration (IR:CM).

4 SOLUTION DESIGN: INTERACTION ROOM FOR CLOUD MIGRATION

(Book et al., 2012) states that an "Interaction Room is a physical room that is outfitted to visualize and facilitate discussion of key aspects of an information system" so that it facilitates communication and allows analyzing and planning, focusing on important aspects and producing constructive results. We use the same concept and build a method, IR:CM, specifically for cloud migration. The method comprises steps and activities, including design thinking exercises which should be conducted in a workshop environment for the duration of 2-3 days depending on the scope and size of the cloud migration project. This would allow understanding of the existing IT strategy, creating an initial cloud strategy by adhering to a hyperscaler's best practices, and focusing on the first N applications to be migrated. As a result, IR:CM helps outline an initial cloud strategy, prepare the migration and modernization path for the first N applications, and establish a cloud adoption framework. Furthermore, to facilitate further communication and discussion in the interaction room, pre-workshop questions were developed to get a high-level overview of the status and situation. These questions can be used as interview questions.

1. What do you consider the main business motivation for the cloud migration?
2. Please outline your role and your responsibilities/interests in your cloud journey.
3. What benefits could the cloud bring to your company?
4. What potential challenges do you foresee?
5. What are some of your company's strengths, when it comes to starting the cloud journey?
6. What is the current landscape for the cloud, and can you share this overview and data?
7. What are the first projects you think would be good candidates for a migration to the cloud?
8. What are your reflections in terms of creating

teams to support your cloud adoption? For instance, in creating dedicated cloud teams, or a Cloud Center of Excellence.
9. Partners: Who will operate and drive cloud adoption? Will you involve partners? If so, what is the plan for partner selection and management?

Based on the answers from the preliminary questionnaire, a high-level understanding can be developed of the customer's characteristics. This would then be used in combination with a set of focus areas during the workshop to guide the conversation whenever needed. This initial understanding serves as the main aid for the facilitator when preparing for the workshop.

The workshop participants shall include relevant stakeholders such as Business (CDO) and IT leads (CIO, Dev, Ops), Process/product owners, and Cloud expert. Process/product owners may bring one or more technical experts from their team, if doing so is justified. However, the customer shall not delegate more than 12 participants to the workshop. On top of this, a facilitator will be included, who shall be skilled in cloud technologies or aided by a cloud expert. The stakeholders shall come together and brainstorm by using canvases such as Hopes and Fears, the Prioritization Matrix, Rose-Thorn-Bud, the Process canvas, and the 7R. The focus areas shall be business motivation, benefits of the cloud, challenges, strengths, and the first set of projects to migrate. The method is depicted in Figure 1.

The Hopes and Fears canvas is a tool which is used in design thinking to assist teams to understand their needs and goals. It is divided into two sections which are the Hopes, where teams brainstorm and list their aspirations, aims, and desires for the product or service being designed, and the Fears section, where teams list their concerns, doubts, and worries about using the product or service. This canvas is intended as a warm-up exercise to release the burden of communicating with each other and the workshop facilitator. Hopes can be framed as Fears and vice versa, therefore the chosen category may also show the general sentiment of the individual towards cloud migration. This exercise can also highlight the well-known blockers or challenges in the organization (which may not be so apparent to the facilitator): these points shall be brought up in further exercises to enrich the conversation. Clustering can be applied on similar items to reduce complexity and identify goals for the cloud migration process.

The Prioritization Matrix is a tool that helps prioritize tasks and opportunities based on a set of criteria. As the name implies, it is represented visually in the form of a matrix, with the items to be prioritized listed along one axis and the criteria for evaluation listed along the other, so that then each item is scored based on how well it meets the criteria. The scores are used to rank the items in order of priority. This canvas is useful for identifying quick wins (items in the top right corner of the Value/Feasibility axes). The layout of the items also highlights the relative effort compared to other tasks and opportunities. It is important to note that in most cases feasibility and value are relative, thus it is advised to document participants' reactions. The facilitator can later use these reactions in further argumentations.

Rose-Thorn-Bud (RTB) is a tool for continuous improvement and team feedback. It is used in team meetings to identify areas of success, challenges, and opportunities for improvement. In RTB, team members share one Rose which is something that went well or that they are proud of, one Thorn which is something that was challenging or frustrating, and one Bud which is an opportunity for growth or improvement. RTB helps discuss emerging common themes, explore ways to address challenges, and take opportunities into account for further development and growth. This exercise covers organizational aptitude and uncovers common blockers, and is used to understand strengths, challenges and opportunities.

After the first three exercises, the participants should have a process in mind which can benefit the most from cloud migration. Examples include e-commerce (customer frontend), banking (loan origination), service providers (disaster recovery, backup strategy), etc.

The Process Canvas is a visual representation tool that maps out the steps involved in a process, the inputs and outputs at each step, as well as the people or teams who are responsible for completing each step. This helps teams understand how a process works, identify bottlenecks or inefficiencies, and design improvements to the process. The Process canvas is used to optimize processes that were selected in the previous step.

The 7R Canvas is a tool for selecting the first set of N applications that shall be migrated or, similarly to Microsoft's naming, the "power of N". During the exercise, the participants argue and agree on a set of these migration candidates and decide on a high-level path for the application. This means categorization according to *AWS*'s 7Rs, which includes seven migration strategies for moving applications to the cloud. These strategies are as follows:

Refactor/re-architect – Change architecture by taking full advantage of cloud-native features for better

agility, performance, and scalability.

Re-platform (lift-tinker-and-shift) – Make a few optimizations without touching the core architecture, just like moving from self-managed *Kubernetes* to *Amazon EKS.*

Repurchase (drop and shop) – Replace your current environment by moving to a newer version of the software or purchasing an entirely new solution.

Rehost (lift and shift) – Move applications to the cloud without changing them.

Relocate (hypervisor-level lift and shift) – Move infrastructure to the cloud without making any modifications, just like using *VMware Cloud on AWS* to relocate virtualized applications from *vSphere to AWS Cloud.*

Retain (revisit) – Keep applications in the current environment since these applications might require major refactoring and need to be postponed for the time being.

Retire – Identify unused applications and decommission or remove them to strengthen the business case and focus on widely used resources.

It is crucial to note that the categorization shall be by no means considered final since unknown technical limitations and capabilities could influence the decision after the workshop. However, in most cases, the path selected for the application should be correct, since the categorization is done by product/process owners.

Based on the above canvases, we can depict a summary of the foreseen outcomes as in Table 1.

The canvases serve as a tool for extracting information from the customer, needed to prepare the customized cloud migration roadmap. Such a roadmap takes all the requirements, opportunities, challenges, and goals into consideration, together with hyper scalers' best practices, to form an adequate roadmap. The workshop also produces the first *N* applications to be migrated and their high-level migration path, which serves as a foundation for an ordered backlog of tasks during the migration. This backlog is regularly refreshed jointly with the experts, keeping the original capabilities in mind. Adopting the cloud can be a long-running process and a forever-evolving activity. So the efforts do not just stop at migrating: The workshop should be conducted regularly – at least yearly – to reflect the changes and continuously review the roadmap.

In order to add knowledge to method design theories, we present the constructed method using the TDEM tool from (Huseynli et al., 2022), which was developed based on (Gregor and Jones, 2007), with the method-specific refinements proposed by (Offermann et al., 2010) and answers to the related evaluation criteria formulated there. We illustrate this below.

Purpose and Scope
- Project type: a method to analyze and plan cloud migration projects.
- Project context: organizations that want to migrate their assets to a cloud environment.
- Lifecycle coverage: analyzing and planning cloud migration projects.
- Role coverage: Business (CDO) and IT leads (CIO, Dev, Ops), Process/product owners, and Cloud expert.
- Activity coverage: Analysis and Planning.

Constructs
- Canvases for 5 different purposes: Hopes and fears, Prioritization Matrix, Rose-Thorn-Bud, Process canvas, and 7R canvas.
- Interaction Room method as in (Book et al., 2012).

Principles of Form and Function
- Conducting exercises based on the 5 canvases for analysis and planning of cloud migration projects in a collaborative and interactive environment.
- The activities or exercises must be done in sequential order, as depicted in Figure 1, since the output of a previous exercise/activity shall be the input of the next one.

Artifact Mutability
- Participants in the interaction room can be different from the ones pointed out above.
- Depending on the number of applications, the number of those to be migrated can be adjusted and can be more or less than *N*.

Testable Propositions
- Utility statement: The method allows for better vendor-independent migration designs.

Justificatory Knowledge
- The Interaction Room method.
- 5 different exercises.
- Utilization in the setting of an organization, to perform cloud migration.

Table 1: Interaction room for cloud migration outcome/summary.

	Hopes and Fears	Prioritization	Rose-Thorn-Bud	Process canvas	7R canvas / summary
Input	Hopes and Fears regarding Cloud & IT strategy	Goals, initiatives, concepts	Anything	A chosen process	Set of applications
Output	Business motivation	Goals and priorities	Strengths, Weaknesses, and Opportunities	Process map	Set of N applications to migrate/modernize
Value	Serves as a warm-up to initiate collaboration	Find goals and align priorities. Set of quick wins can be found	Practitioners get to highlight and reason	Discover applications and dependencies in a given process	Serve as a foundation for an ordered backlog

Principles of Implementation
- Activities have to be conducted, and in the end, the result should be a constructive summary where aims and desires have been considered and there is a clear path forward, illustrated through a Process Canvas and 7R summary.
- The method usage requires the initiation of a cloud migration project.

Expository Instantiation
- The individual exercises and their facilitation have been used in adesso Hungary before, however, the combination of them with the aim of cloud migration has not been tested yet. This is up for further evaluation, research and documentation from the authors.

5 CONCLUSION

Cloud migration is an essential process for organizations that want to improve their efficiency and reduce costs associated with their existing systems. The Interaction Room Method for Cloud Migration (IR:CM) is a methodical approach that can assist organizations in performing an effective and safe migration. The IR:CM method emphasizes communication between all stakeholders, considers key aspects, and prioritizes requirements for a smooth analysis and planning of cloud migration tasks. The method has been constructed using a Design Science Research process and method engineering. This systematic approach is designed to address the limitations of current methods and tools for cloud migration and provides a clear and structured process for identifying critical aspects and developing a migration plan. This research highlights the importance of a methodical approach to cloud migration and the potential benefits that can be achieved by using a well-defined approach such as IR:CM. By utilizing this method, organizations can increase their chances of success and reduce the risk of faults and poor results.

Future work could include evaluating the IR:CM method with applying it in several real-world scenarios to further improve its effectiveness. Further research should also involve exploring ways to integrate the IR:CM method with other project management and planning methods. It could be used to study the long-term benefits and drawbacks of cloud migration and how IR:CM can assist in maintaining and supporting the cloud infrastructure.

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