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Proposal of a visual impact analysis approach based on enterprise modeling: Case of customer experience projects in the banking sector

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Abstract. Customer experience is often presented as a competitive battlefield; however, it is defined so broadly, so holistically that companies find it challenging to implement and to analyze its impact on increasingly complex information systems. In this perspective, we present a support approach for digital transformation projects around the customer experience, using a visual impact analysis based on enterprise modeling. We illustrate the use of this model in a real banking environment.

Keywords: Digital transformation, Customer experience, Enterprise Architecture, Enterprise modeling, Impact analysis.

1 Introduction

With the emergence of new digital technologies, the banking world is not spared by the arrival of new players, in particular bionic banks (100% digital), which are shaking up value chains and putting traditional players in a position to react vigorously to face this new competition [1]. The banking industry has therefore embarked on gigantic, multi-year strategic digital transformation programs. Thus, the banking sector is at the forefront [2] and ranks 4th among the most digitally transformed sectors. A panoramic reading of the latest strategic plans announced by all most banks indicates an acceleration of the pace with colossal spending forecasts. For example, the BPCE banking group in France calls its strategic plan TEC2020, whose name highlights the importance of technologies in its transformation [3] with an investment forecast of 750 million euros.

One of the main reasons for these investments is the potential capacity of new technologies to improve the customer experience [4,5,6]. This customer experience is, more and more, considered as the new competitive field of marketing. In one of its publications, the Consulting Firm "Gartner" underlined that 57% of customers stopped buying from a company because a competitor offered a better experience [2]. According to an empirical survey of the same study, it also found that 67% of customers say they are willing to pay more for a better customer experience. Customers are

accustomed to digital interaction in many areas of daily life; likewise, they demand financial services that are available 24/7 and as user-friendly as the social networks they use every day [6,7,8].

This change in consumer habits forces banks to tackle their customer process as a matter of urgency so as not to be left behind in a rapidly changing market. However, the undertaken projects often remain at the starting point [1]. This is, for a large part, due to the complexity of the implementation of this transformation; indeed, it is a complex process [9,10], affecting several areas and components of the organization. It involves managing the volatile behavior of customers, understanding their complex data [10], carrying out numerous optimizations of customer processes [9] and transforming business models organization [10] to integrate various digital technologies [11] and to adapt to changing business conditions [12].

This implementation is more complex as organizations do not have the "privilege" of starting from a blank sheet to design their customer experiences. Most have already established customers, processes and assets that require reorientation to achieve specific customer experience strategies. Based on our expertise in digital transformation consulting, we observe that managers suffer from the lack of tools allowing the analysis of the existing to define a coherent target strategy. Consultants often tend to launch their projects from scratch and design ideal transformative customer experiences almost independent of the business's actual context. With this in mind, this article proposes a visual analysis approach allowing managers to lead the transformation better by analyzing their impacts on the company and considering the existing environment. As an example of transformation, we examine projects around improving the customer experience.

This approach is based on the Enterprise Architecture (EA) to define an Information System target strategy (To-Be) and a planning of activities and resources based on the existing business environment (As-is) [13,14]. This article relies on a new Enterprise Model [15] used as part of a real banking transformation around the customer experience. This study aims to help managers better understand the contribution of EA and EM in supporting digital transformation.

The paper is organized as follows. Section 2 presents a literature review. Section 3 retraces the scientific basis of the model that we use in our case study [15], section 4 presents the case study and the results obtained. Section 5 concludes the paper.

2 Context and background

2.1 The customer experience, a major shape of the digital transformation

Digital Transformation (DT) operates a radical change in the structure, processes, functions and business models of an organization [12,16], this change is driven by the adoption of digital technologies for the purpose of improving company performance [8,17]. Digital transformation promises organizations many benefits, including improved organizational processes [12,18,19], improved customer value propositions [4,20], improved service quality [21], cost reduction [4], innovation and improved customer experience [20] and increased revenue [16].

The study by [17] summarizes the facets of DT in three main areas: a) Customer experience; b) Business processes; c) Business model. Each of these three areas is divided into three sub-elements. The customer experience is broken down into three sub-elements: customer understanding, revenue growth, and customer touch points. What is interesting is that traditionally the customer experience has only been viewed from the perspective of different touchpoints [22]. Westerman et al. paint a more complete picture by adding elements around streamlining sales and digital marketing processes, as well as new capabilities to better understand customers and their volatile behaviors [17]. Numerous studies have examined the implementation of digital transformation to improve the customer experience. Matt et al. (2015), for example, assess strategies and target policies around the customer experience [12]. Klaus et al. (2013) and Kane et al. (2015) examine engagement processes to improve the customer experience [23,24]. Berman (2012) and Westerman (2014) analyze critical factors to reshape the customer value proposition [9,5]. These studies tend to focus mainly on defining the customer experience and its ecosystem in the company. Few attempts have been made to develop a comprehensive approach to helping managers deploy these projects by analyzing their impacts on the business and by considering its existing environment.

2.2 Enterprise architecture and its contributions

There are different definitions of Enterprise Architecture (EA). They can generally be classified into two different categories [25]: descriptive and prescriptive. Descriptive definitions generally consider architecture as a set of models that document how the business is built and how it operates. Op't Land et al. (2008) define it as: "*A coherent set of descriptions, covering a perspective oriented towards a shared target, the EA provides indicators and controls which allow an informed governance of the evolution and the business success*" [26]. The prescriptive, normative school in turn focuses on the construction process and the rationale for a business transformation. An example of this category is the definition of the Federation of Professional Organizations of Enterprise Architecture (2013): "*A well-defined practice to perform the analysis, design, planning and implementation of actions of the business, using a holistic approach to the successful development and execution of strategy*" [27]. Over the years, studies have linked several benefits of EA. These are generally indirect, large-scale, company-wide, and perceived over a long period of time, which makes it difficult to calculate an exact return on EA investment [28]. However, in the very rare cases where the ROI has been calculated, the results appear remarkable [29].

2.3 How to position EA in the business ecosystem, how could it work in practice as part of improving the customer experience?

The relationship between EA and business strategy has already been explored in the literature. The best-known example of this school of thought is the concept of the "execution foundation" proposed by Ross et al. (2006) [30]. They explain how an organization can better execute its strategy and facilitate continuous change with the help of EA. For Ross et al. (2006), each company has its own execution foundation;

this foundation sets certain limits on future business strategies. To perform these continuous changes, certain capabilities are required, such as IT infrastructure and business processes. The EA model, which is derived from the organization's operational model, defines these basic capabilities and provides documentation to understand them and understand their dependencies. The EA also provides the best practices for implementing changes that are inevitable when executing strategic initiatives. To build an adequate foundation for conducting business strategies, companies must, according to the study, master three key elements (Fig. 1):

Operating model. The operating model describes the necessary level of integration and standardization of customer processes to master the customer experience. Companies have different levels of process integration in their business units. The integration enables end-to-end processing and a single face for the customer; it forces a common understanding of data across various business units.

Enterprise architecture. EA represents the organizational logic of IT in the service of business processes. It covers the integration and standardization requirements of the company's operating model. EA models offer rules, standards to be respected, and a long-term view of a company's processes, systems and technologies so that projects can develop sustainable capabilities, and not just meet immediate needs.

The engagement model. Also known as the enterprise model, represents the governance mechanisms that ensure that business and IT projects achieve desired objectives. The engagement model influences project decisions so that all solutions are guided by the rules and standards enacted by the company's architecture. The engagement model aligns the IT and business objectives of the projects and coordinates IT and business decisions taken at several levels. We will attempt in our case study this contribution using the enterprise model of [15].

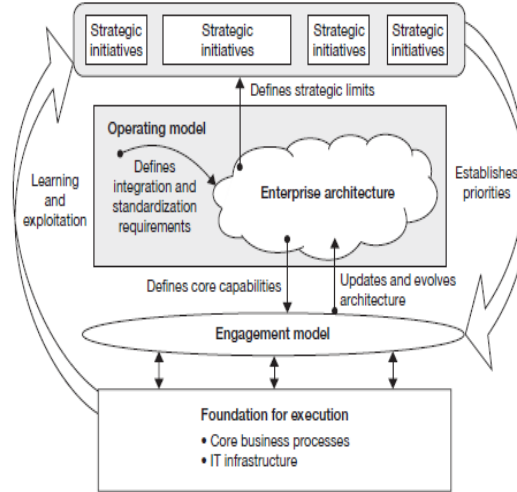


Fig. 1. The foundation for the execution of (Ross et al., 2006)

In summary, the model of Ross et al. posits EA as an integral part of a steering mechanism between business processes and strategic initiatives. It provides certain limits for the formulation of the business strategy. It defines the capacities base of organizations, serving as a catalyst for the construction and continuous evolution based on the engagement model (called in our study the Enterprise Model). However, this model of Ross et al. lacks a critical element for our study: its connection to the larger context of digital transformation. This link is not very well explained in Ross et al., nor in the publications found during our literature review. In the context of digital transformation and rapidly changing industries (e.g., banks), an interesting angle around strategic initiatives deserves to be taken up: the concept of emerging strategies versus deliberate strategies [31]. The emergence of new technologies (e.g., Artificial Intelligence, Data Analytics, etc.) shapes the strategies formulated previously and how companies could have implemented them. The execution foundation enriched with new technologies no longer serves to set certain limits to future business strategies. It must henceforth help define new emerging strategies necessary for the company's survival in today's digital context.

In the next section, we will use an enterprise model to help managers perform visual impact analysis as part of a banking transformation with the goal of improving the customer experience.

3 Use of the digital transformation-oriented enterprise (DTO) model

We use the enterprise model from [15] for our case study. We rely on this because it allows a simple visualization (not very technical) accessible to managers. This model was built respecting the design science protocol described by [32]. It uses the concepts

of ArchiMate [27]; we will only use some of these concepts for our case study. The next chapter reviews the structure of this model and its architectural foundations.

3.1 DTO Principles: Flexibility by Design

In today's banking world, the economic success of a bank depends on its ability to react to change quickly and flexibly. According to Hafsi et al. (2018), the flexibility and agility of organizations are identified as necessary conditions to facilitate the digital transformation of organizations [15]. This flexibility is based on the degrees of autonomy available in the organization. It is an internal response to the speed of external change

The concept of "decoupling" highlights the structural constraints inherent in the company and presents them as one of the key elements of the organization. Therefore, according to Hafsi et al. (2018), improving flexibility means: "*Seek to reduce the coupling between certain entities of the organization*". Faced with this search for flexibility, the objective is to identify the decoupling levels; two levels are identified (Figure 2).

Vertical decoupling. Regarding the best practices supported by the Open Group (2017), Hafsi et al. (2018) recommends the separation between the process layer and the organizational environment layer [15]. Indeed, to manage the company transformation, process changes must potentially be decoupled from changes in the organizational context. For example, a change of human resources, in the structuring of the databases, or even in the application solutions, can be introduced without impact on the concerned process. The same process must be simulated in several alternative environments; for example, the same process can be implemented in several production sites. Its simulation within these different sites will allow it to assess its performance according to the environment or facilitate its transfer between two sites.

Therefore, Hafsi et al. (2018) distinguish between a "process" view and an "organizational environment" view:

- The "process" layer describes the entire business process at different levels of granularity. This layer is made up of different types of processes: informative and physical.
- The "organizational environment" layer groups together objects which operate on the company's environment and which may have an impact or be impacted by its behavior.

Using this model for our case study would allow us to qualify the degree of decoupling of processes from their organizational environment.

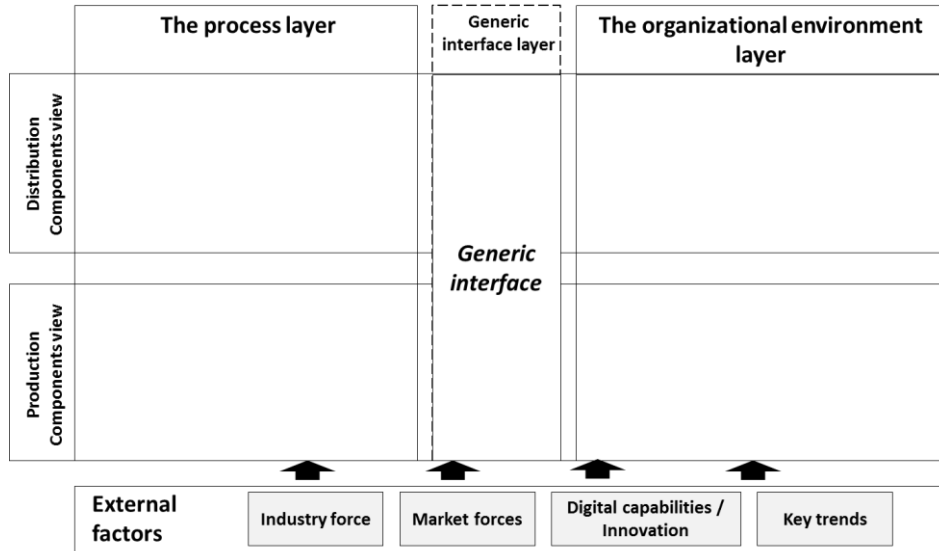


Fig. 2. The DTO model canvas (Hafsi et al., 2018) [15]

Horizontal decoupling. This decoupling is part of a goal to separate the processes by their nature and according to the objectives achieved by these processes. This horizontal decoupling is presented in two distinct views of modeling.

- View of production processes includes all the services and data necessary to support and manage the products owned by customers. It is "the factory of the company". Its objects also include all production services of a transversal nature: Archiving, Editing, Manufacturing, Invoicing, Taxation ...
- View of distribution processes: customer-oriented, this view includes all the business capabilities and customer processes necessary to develop the business and manage the customer relationship (pre-sales, sales, and post-sales).

In the context of digital transformation, this distinction between these two layers is more necessary as the response to customer needs must be transparent and isolated from the concerns of production processes and internal support (Hafsi et al., 2018). Using this model for our case study would qualify the degree of decoupling between distribution and production processes.

Modeling external factors. In the context of digital transformation, companies are exposed to their environments, it is necessary to control external factors such as social and regulatory constraints. Other factors such as key trends, market forces, industry forces and macroeconomic forces should be identified [15]; these elements seem to have an impact on all parts of the business and cannot be dealt with in isolation from the others.

4 Case Study

4.1 Industrial context

For confidentiality reasons, we call the company where we operate "ITBank X". "ITBank X" is an internal services company of a large European banking group. Its 1,600 employees develop and maintain the information system of member banks. "ITBank X" also contributes to developing the IS roadmap, which is a multi-year business plan focused on users and customers. This roadmap is fed into the business projects undertaken each month by the bank representatives who represent their peers on the IS Decision-making Committees. ITBank X has launched a major digital transformation program we call "DIGI TRANSFO", it shows a real desire to transform in the service of its customers.

4.2 Expected objectives

Two categories of objectives are pursued in this study:

- Scientific: Explore the contribution of Enterprise Architecture in supporting digital transformation projects using enterprise modeling. This use is a continuation of research work around the DTO model [15] and is part of the process of evaluating the model in a real industrial field [32].

- Industrial: Help ITBank X map its existing processes and applications related to the customer experience, then use this mapping to analyze and visualize the impact of new projects initiated on the business environment. For this paper, and for confidentiality reasons, we are limiting ourselves to certain customer experience processes and we are exposing a reduced scope for illustration.

4.3 Mode of intervention

The two objectives were clearly identified from the start of the intervention, and the mission sponsor is aware of our dual role: consultant and researcher. Our intervention lasted 6 weeks full time to carry out the analysis methodology described in [15].

4.4 Analysis methodology

Step 1 – Instantiation of the DTO model: In this first step, the company discovers the model, we decide with the sponsor the level of detail expected by our analysis, the scope of our intervention and the stakeholders who will participate in the study, the choice made is as follows:

- Granularity of the objects visualized on the model: Macro process, application, integration application, external factors (banking regulations and technological trends), we use the concepts of ArchiMate 3.0 taken up by the DTO model.

- Scope: this is the functional perimeter dealing with the entire customer journey, from his contact with the company to bank charges, it is an end-to-end vision covering the customer journey but also the induced of this journey in the company's support processes.

- Participants: As part of this study, we are working with business experts in the field of banking distribution and processes already documented and implemented, with application managers in the distribution scope, and then with architects with a strategic, business, and IT transverse vision.

Step 2 – Mapping the processes on the DTO model: In this step, we work with the business experts to map the macro distribution process covering the customer journey and impacting the customer experience and the production processes necessary to achieve them. We have identified 8 macro processes (figure 3).

Step 3 – Mapping the applications on the DTO model: In this step, we work with the application managers to map the applications covering all the processes mapped by the business experts. We then identified the integration capabilities that these applications need for them to function properly. We identified 10 applications and 2 integration applications (Figure 3).

Step 4 – Inventory of external factors: We asked all the participants, based on the framework of the DTO model [15], what were the external factors that could impact the functioning of the current ecosystem, we identified two categories: banking regulations and technological trends (Figure 3).

Step 5 – Analyze the existing architecture principles: Based on the DTO model (Figure 4) and its architectural principles, we analyze the concepts of flexibility and decoupling by answering these questions:

- Do the process and the application respect the right granularity? The process and the application must meet one and only one business objective.
- Are the process and application of distribution well decoupled from those of production?

Step 6 – Analyze the gaps between customer experience processes and existing applications: Based on the DTO model and its architectural principles, we analyze the alignment of IT on the business (figure 4) by answering these questions:

- Are all the processes covered by the applications?
- Does the application meet a business purpose?

Step 7 - Visualize the alignment of IT on customer experience processes: For a given business objective, visualize the process and all the applications and integration application that carries it, this will give better visibility for the manager of the ecosystem for achieving this business objective (figure 5).

4.5 Analysis results

We follow the method proposed by Hafsi et al. (2018) to analyze the results of using the model and its instantiation [15].

Knowledge sharing through simple visualization. The managers confirmed that the instantiated model (Figure 3) provided an easy-to-understand visualization of the scope covering the customer experience (process and application). The objective of sharing common knowledge has been achieved. This shared vision allowed participants to propose new ideas (eg. having customer knowledge management from social networks) which were not part of the business objectives expressed previously.

Analysis the DTO model architecture rules. Mapping analysis of DTO model allowed us to ask questions about the scalability of the company's components, we observed 3 types of non-compliance with architecture rules (figure 4):

- Non-decoupled application: the application numbered 7 performs both distribution and production processes.
- Non-rationalized applications: Applications 11 and 12 all meet the same business objective (cost accounting), this often generates, according to application managers, a redundancy of the results obtained, more surprisingly, these produced results are sometimes not the same because applications 11 and 12 have different management rules, developed differently by different teams.
- Process meeting several business objectives (e.g., Marketing and support). This induces very expensive transformations because they are not delimited and well framed (not targeted by process),

This analysis allowed managers to be aware of the need to be more flexible in an environment such as that of the bank, which is constantly changing. The managers would like to examine proposals for new information system transformation projects (applications and processes) to acquire sustainable development capacities for the next digital transformations [30].

Identification of new needs to improve the customer experience and impact analysis through visualization of the alignment. During our mapping work, the business experts identified a new need that could improve the customer experience. It is based on a new technological trend known in the banking world as “Logics and event-oriented architectures or asynchronous mode”. The business experts have expressed their desire to take advantage of this technology to cover a business need: Cross-Channel accessibility; it is the possibility of a customer switching from one distribution channel to another, using a real-time notification system, without interrupting the journey. Thus, the customer could start his credit application at a branch and finalize it on his smartphone or another available channel. This is an example of a business need identified from a technological capacity in the market. The analysis of this new need using the model (figure 5) allowed managers to place it in the company's ecosystem. This facilitated the ability to detect: a) Existing processes and applications including business needs to deploy this new need; b) New applications or processes to be defined and implemented; c) Integration applications to be defined and implemented (e.g., the ability to manage events and their integration into the ecosystem).

4.5 Reflection on the use of the model

Through the application of the DTO model, we gathered feedback regarding **the** its applicability and usefulness. According to the participants, the analysis based on the DTO model was helpful and met their expectations. The model focused on IS agility issues and allowed "unspoken needs" to appear in an easy to understand way:

- According to managers, using the DTO model enabled them to carry out impact analysis to support their transformation projects, based on a visualization of the existing environment. This visualization made it possible to share knowledge and raise awareness of the sustainable capacities for evolution (organizational agility) that the bank should develop to be able to keep up with the accelerated pace of digital transformations.

- According to managers, the analysis was relevant. In addition, most of them felt capable of reusing the DTO model on their own for their next IS diagnostic needs upstream of transformation projects.

- According to managers, the study was successful in terms of results and findings, as it confirmed and reinforced some of their own perceptions on the agility and the structuring needs of the IS. This allowed them, for example, to focus more on certain integration bricks belonging to the generic layer of the model.

- The participants unanimously validated the relevance of the concepts and requirements of the DTO model (decoupling, modularity, modeling of external factors, etc.).

- Some participants gave us some recommendations on the instantiation process and how to involve participants. For example, it was requested to merge the 3 phases of Mapping in the same meeting to allow business experts, application managers, and architects to discuss more business issues. This would push the brainstorming mind into thinking to imagine other ways of optimizing the IS.

- Finally, an architect (ArchiMate Certified) preferred a more complete architectural model with full instantiation of all ArchiMate concepts. For him, it would be better to be able to identify all the design problems of an IS component.

5 Conclusion

According to the literature and our experience in digital transformation consulting, improving the customer experience is a complex process. For this, we used the DTO model of (Hafsi et al., 2018) to help managers carry out their impact analyzes of this complex process using a visualization of the existing environment. This visualization allowed managers to share knowledge and raise awareness of the sustainable capacities for evolution (flexibility by design) that the bank should develop to be able to keep up with the accelerated pace of digital transformations.

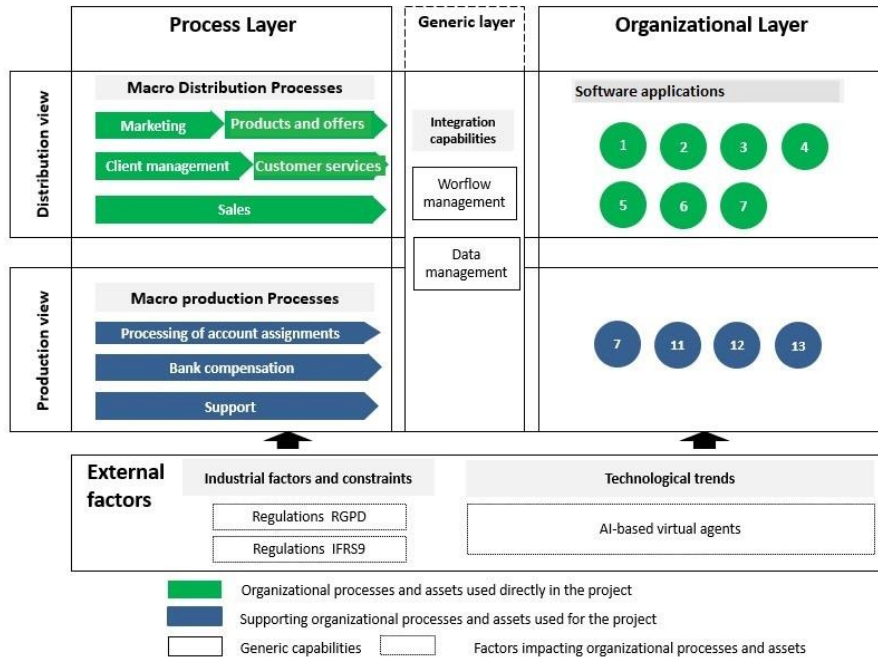


Fig. 3. Mapping of processes and applications

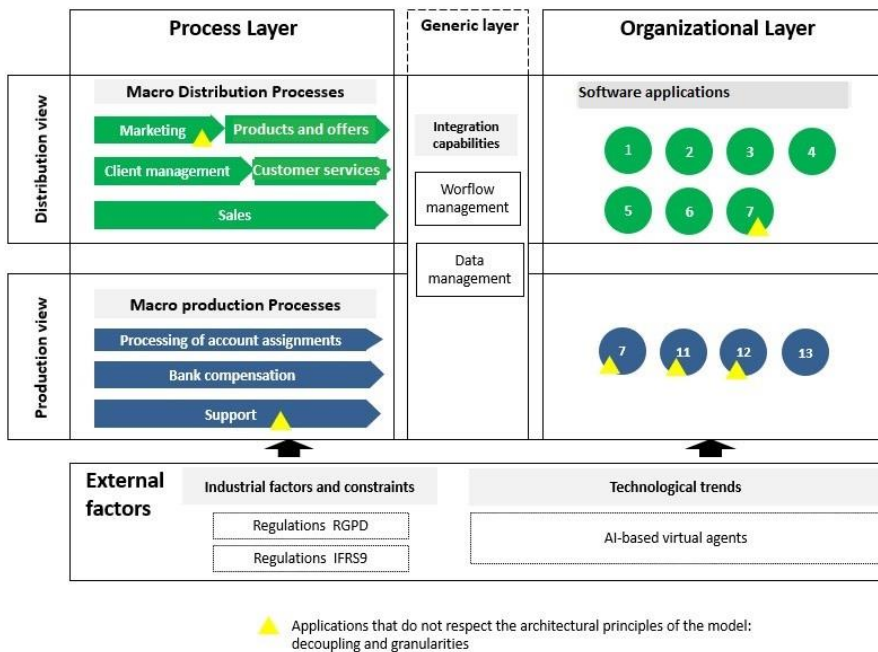


Fig. 4. Visualization of the non-compliance of the existing components with architectural rules

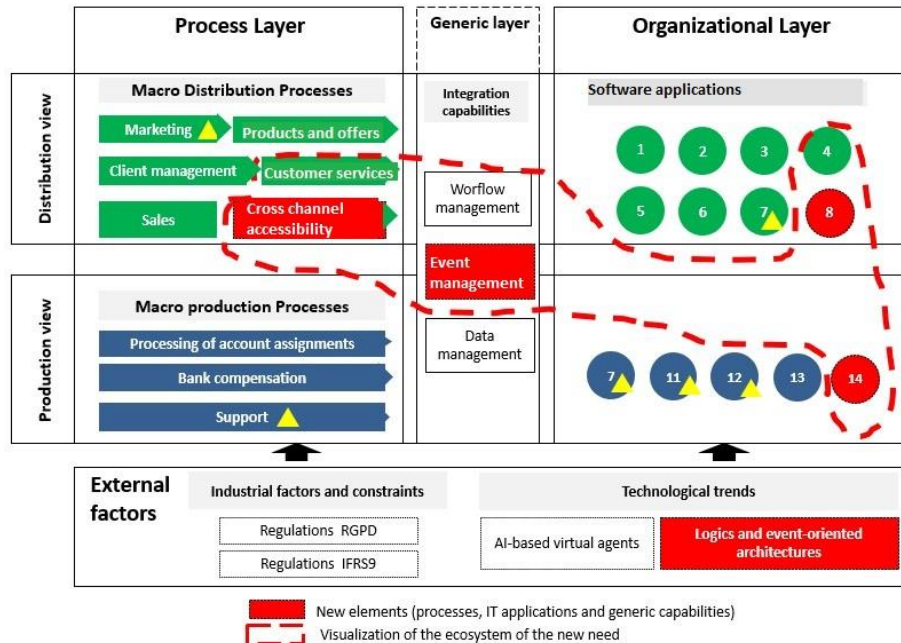


Fig. 5. New need identified and visualization of its ecosystem

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