Digitalisation by Enterprise Architecture Management: Practical Recommendations

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Abstract: This research in progress paper describes how enterprise architecture management can support digitalisation. It is based on an initial literature review and provides practical recommendations. The revealed key strategic recommendations are: (1) use capability-based planning, (2) include product IT in EAM and (3) give EAM-practices the required power in the organisation.

Keywords: enterprise architecture management; digitalisation; digital transformation

1   Introduction

Enterprise architecture (EA) can support transformations (e.g. process reengineering) by impact analysis and providing implications for capability changes in the area of business, data, application and technology [WF06]. Despite this promising possibility the topic enterprise architecture management (EAM), is perceived by the author, as discussed academically. There are recently signs to change the discussion towards a more practical one, like the proposal from market researcher Gartner to renew enterprise architecture programs [Om20]. For this reason, the focus of this research in progress paper is to give practical recommendations on how digitalisation can be enabled by enterprise architecture management. Thus, the target group is practitioners and scientists. The applied method is an initial literature review.

The terms digitalisation and EAM have several definitions. We support the definition of digitalisation as an organisational- or process-related change, which is induced and enabled by technology. This often includes a shift from physical to digital value creation [KSS18, PH15].

Enterprise architecture management is understood as the fundamental organisation of a corporation and "the principles governing its design and evolution" [WF06]. The primary domains in an organisation according to TOGAF are business, data, application and technology and their relationship to each other [To18]. Furthermore, EAM can be used to create and visualise reference architectures, like the ones for the aviation- [Su16] and pharma industry [Su18].

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2   Related work

The literature shows the current level of research on the topic being discussed. The section "Practical recommendations" below presents further developments based on previous research.

The International Telecommunication Union provides guidance on the evaluation of the maturity of an organisation regarding digital transformation. Examples of organisation's maturity are "digital laggard" or "digital leader" [ITU19]. Kaidalova et al. [KSS18] enhanced the discussion of digitalisation regarding the consideration of not only corporate IT, but also product IT (e.g. smart devices). EAM has also been explored in prior studies by Babar & Yu [BY15]. Due to the authors, EAM must widen its scope and handle differently multiple levels of dynamics (e.g. operational- and innovation processes) in organisations [BY15].

More than 50 frameworks are available in enterprise architecture managements [Ma11]. One of the most used is "The Open Group Architecture Framework" (TOGAF). The latter was the basis for an approach to move organisations towards digitalisation [HA16].

Korhonen & Halén suggest that digitalisation should be fully integrated in every hierarchical level and function of an organisation for its full benefit. Digitalisation is currently often run as a program in organisations [KH17].

There are also related approaches to transform organisations, e.g. Architecture of Integrated Information Systems (ARIS) [ÖB05]. Further details will be provided in the section "Practical recommendations".

A recent study from 2019 with more than 1,500 respondents shows some insights for enabling digitalisation. It was conducted by the company "LeanIX GmbH", that provides an EAM-tool with the same name [En19].

Wißotzki and Sandkuhl suggest a process for the digitalisation and transformation of organisations. It includes mainly such disciplines as business model management, capability management and enterprise architecture management [WS17].

3   Practical recommendations

In this section we give practical recommendations to drive a company towards digitalisation with the help of EAM. We propose to split recommendations into strategic and supportive. The latter assists the strategic recommendations from EAM-related areas.

3.1   Strategic recommendations

First of all, an organisation should conduct a maturity evaluation regarding digitalisation. This can be a starting point for roadmap creation towards digitalisation.

There are several pathways to move an organisation to the desired position, e.g. digital leader [ITU19].

Furthermore, a capability-based planning should be conducted. This is a technique for planning of investments in capabilities (e.g. finance) [KH17]. Business capability maps in general strengthen and improve the communication of business and IT and thus business IT-alignment. Examples are the alignment on business demands and prioritizing of the support per capability. However, one main challenge of business capability maps is a lack of understanding followed by a high creation effort. These findings were gathered by Khosroshahi et al. in expert interviews [Kh18]. Considering the benefits mentioned above, it can be helpful to invest effectively in digitalisation. That is why a diagram showing the relation between capabilities and their supported applications is needed. The latter can help to identify white spots and do business modelling. By creating such a diagram organisations support digitalisation by verifying and defining the current and future business model.

We strongly suggest that an EAM-practice should govern, design and evaluate the full enterprise architecture. EAM's scope is currently focused on corporate IT and often disregards the product IT. IT components, which are built into the products are presently understood under the term product IT [KSS18]. An example can be a fingerprint sensor, which uses machine learning servers. With this information in an EAM-tool one can optimise the workload of the server with other IT-services from the corporate IT. And there are more examples where product IT with its internet of things devices can leverage more potential in combination with the corporate IT.

The multiple level of dynamics can be available in organisations, e.g. regarding approaches of software development (agile vs. traditional). It can be that one team creates microservices in an agile way and another team works with the traditional waterfall model. Both must be considered in EAM, but in a different way regarding EAM-governance and autonomy. This will help organisations to keep up with today's highly dynamic environment [BY15].

In order to digitalise an organisation two things must be considered from organisational point of view. Firstly, EAM-departments should be located close to the top in the IT organisation. By such a way it is possible to align directions directly with CIO/CDO and EAM has the power to lead the required changes of digitalisation. Secondly, digitalisation should be integrated in every function of an organisation in order to fully leverage the potential of digitalisation [KH17]. Thus these functions must align strongly with EAM to meet the desired strategy.

TOGAF's core is the Architecture Development Method (ADM). This approach enables organisations to create an enterprise architecture as well as to "shape and govern business transformation and implementation projects" [To18]. For this reason TOGAF ADM can be used as a driver for digitalisation. Similar research proposes to focus an EAM-practice on four areas: aligning a unified view for all stakeholders, creating the architecture vision, operating an architecture repository and conducting stakeholder management [HA16]. It

depends on the project and organisation, which deliverables per phase are required. An overview of them is given in the TOGAF standard [To18].

If an organisation wants to use an existing process (e.g. [WS17]) to conduct the digitalisation or adapt a process, needs to be decided upfront. The mentioned process requires knowledge in the areas of business model management, capability management and enterprise architecture management [WS17]. In large-scale enterprises this requirement can be matched, but small and medium-sized enterprises likely have a knowledge gap in this matter. External consultants might be hired to fill the latter.

Furthermore, we suggest that EAM should challenge programs and projects in order to fit to the future state of the organisation. This could be done via deliverables and reviews at specific milestones. In such a way the alignment of programs and projects towards the strategy can be improved.

The above-mentioned cross-industry study, conducted by the provider of the EAM-tool "LeanIX" with more than 1,500 participants, indicates that the top three obstacles for digitalisation are: (1) legacy applications, (2) IT security concerns and (3) application integration challenges [En19]. These obstacles can be overcome in an EAM-practice by analysing the as-is situation, getting buy-in from stakeholders and creating an EAM-roadmap. The study also revealed that a high EA maturity is a strong driver for having a high digital maturity, e.g. being a digital leader [En19]. That is why we strongly suggest ensuring that the maturity of your EAM-practice corresponds with your prospective digital maturity.

The figure (Fig. 1) below gives a summary of the strategic recommendations, which are surrounded by the supportive recommendations. Both can enable an organisation to become a digitalised one.
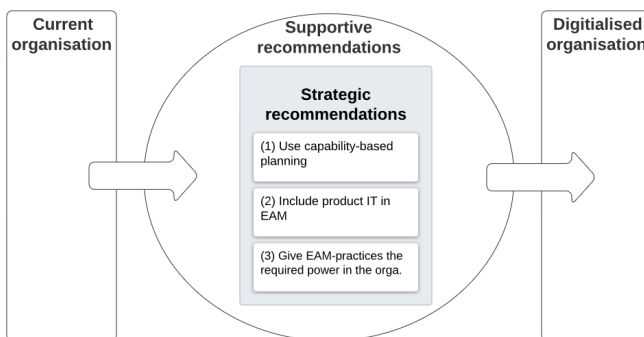

Fig. 1: Summary of strategic recommendations

3.2 Supportive recommendations

The strategic recommendations can be assisted with supportive ones. These are from EAM-related areas.

The domain business engineering is linked to the business architecture of EAM. It has the target to deliver innovative business models in a systematic approach. There are several approaches in business engineering, notable are: Multiperspective Company Modelling (dt. Multiperspektivische Unternehmensmodellierung [MEMO]), Business Engineering St. Gallen (dt. St. Galler Ansatz des Business Engineering), Architecture of Integrated Information Systems (ARIS) and TOGAF. The mentioned approaches can help to drive the transformation of digitalisation [ÖB05].

As stakeholder commitment is required to change an organisation towards a digital one, it is recommended to manage the changes in a change management model. Several models are reported in the literature to address this need [WW17]. Worth a mention are the Prosci ADKAR Model, the 3-Phase Model of Kurt Lewin and Kotter's 8-Step-Change Model.

4   Results & Discussion

In this paper we have given some practical recommendations to use EAM for driving digitalisation. We have suggested to: (1) use capability-based planning, (2) include product IT in EAM and (3) give EAM-practices the required power in the organisation. As a supportive recommendation it is worth to mention that EAM-related areas like business engineering and change management can support the digitalisation program.

Future research to give a complete overview of the topic might extend the practical recommendations and is appreciated. It will be important that future research completes the literature review in this research in progress paper. Furthermore, a case study in the industry could be conducted to evaluate the proposed recommendations.

Bibliography

[BY15]   Z. Babar and E. Yu, 'Enterprise Architecture in the Age of Digital Transformation', in Advanced Information Systems Engineering Workshops, vol. 215, A. Persson and J. Stirna, Eds. Cham: Springer International Publishing, 2015, pp. 438–443.

[En19]   LeanIX GmbH, 'Enterprise Architecture Insights Report 2019'. Available: https://www.leanix.net/en/download/enterprise-architecture-insights-report-2019 (accessed May 21, 2020).

[HA16]   M. Hafsi and S. Assar, 'What Enterprise Architecture Can Bring for Digital Transformation: An Exploratory Study', in 2016 IEEE 18th Conference on Business Informatics (CBI), Paris, France, Aug. 2016, pp. 83–89, doi: 10.1109/CBI.2016.55.

[ITU19] International Telecommuncation Union, 'Digital transformation and the role of enterprise architecture'. Available: https://www.itu.int/pub/D-STR-DIG_TRANSF-2019. 2019 (accessed May 17, 2020)

[KH17] J. J. Korhonen and M. Halén, 'Enterprise Architecture for Digital Transformation', in 2017 IEEE 19th Conference on Business Informatics (CBI), Thessaloniki, Greece, Jul. 2017, pp. 349–358, doi: 10.1109/CBI.2017.45.

[Kh18] P. Aleatrati Khosroshahi, M. Hauder, S. Volkert, F. Matthes, and M. Gernegroß, 'Business Capability Maps: Current Practices and Use Cases for Enterprise Architecture Management', presented at the Hawaii International Conference on System Sciences, 2018, pp. 4603–4612, doi: 10.24251/HICSS.2018.581.

[KSS18] J. Kaidalova, K. Sandkuhl and U. Seigerroth, 'How Digital Transformation affects Enterprise Architecture Management – a case study', IJISPM - International Journal of Information Systems and Project Management, no. 06, pp. 5–18, 2018, doi: 10.12821/ijispm060301.

[Ma11] D. Matthes, Enterprise-Architecture-Frameworks-Kompendium: über 50 Rahmenwerke für das IT-Management. Berlin Heidelberg Dordrecht London New York: Springer, 2011.

[ÖB05] H. Österle and D. Blessing, 'Ansätze des Business Engineering', HMD Prax. der Wirtschaftsinformatik, vol. 241, pp. 7–17, 2005.

[Om20] G. Omale, '8 Steps for a High-Impact Enterprise Architecture Program'. Available: https://www.gartner.com/smarterwithgartner/8-steps-for-a-high-impact-enterprise-architecture-program/ (accessed May 30, 2020).

[PH15] M. E. Porter and J. E. Heppelmann, 'How Smart, Connected Products Are Transforming Companies', Harvard Business Review, October 2015, Oct. 01, 2015.

[Su16] Sultanow, E., Brockmann, C., Schroeder, K. and Breithaupt, C.: Lufthansa Aviation Standard: Developing an Open Group Reference Architecture for the Aviation Industry. In: Mayr, H. C. & Pinzger, M. (Eds.), INFORMATIK 2016, Klagenfurt, Gesellschaft für Informatik e.V. (p. 825-836), 2016.

[Su18] Sultanow, E., Chircu, A. & Schroeder, K. amd Kern, S.: A Reference Architecture for Pharma, Healthcare & Life Sciences. In: Czarnecki, C., Brockmann, C., Sultanow, E., Koschmider, A. and Selzer, A. (Eds.), Workshops der INFORMATIK 2018, Berlin, Architekturen, Prozesse, Sicherheit und Nachhaltigkeit, Gesellschaft für Informatik e.V. (p. 25-40), 2018.

[To18] The Open Group, 'The TOGAF® Standard, Version 9.2' 2018 Available: https://pubs.opengroup.org/architecture/togaf9-doc/arch/ (accessed May 23, 2020).

[WF06] R. Winter and R. Fischer, 'Essential Layers, Artifacts, and Dependencies of Enterprise Architecture', in 2006 10th IEEE International Enterprise Distributed Object Computing Conference Workshops (EDOCW'06), Hong Kong, China, 2006, pp. 1–12, doi: 10.1109/E-DOCW.2006.33.

[WS17] M. Wißotzki and K. Sandkuhl, 'The Digital Business Architect – Towards Method Support for Digital Innovation and Transformation', in The Practice of Enterprise Modeling, vol. 305, G. Poels, F. Gailly, E. Serral Asensio, and M. Snoeck, Eds. Cham: Springer International Publishing, 2017, pp. 352–362.

[WW17] M. R. Wolf and U. Wiese, 'Change Management für Informatiker: Theorie und Praxis für erfolgreiche Projekte', in INFORMATIK 2017 Chemnitz, Germany, Sep. 2017, M. Eibl and M. Gaedke Eds., 2017, pp. 2595–2597, doi: 10.18420/IN2017_265.