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A Maturity Model for Measuring Digital Transformation of Archives and Libraries

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Abstract: The digital transformation is a process that has impact on several fields and thus has technological, economical, and also social dimensions. Even the speed of developments in different areas is varying. For libraries and archives the digital transformation is a major challenge as they are affected by the way they work and interact with their customers as well as digitized and born-digital artefacts are relatively new objects for long-term preservation.

For years the library and the archives of social democracy (AdsD) of the Friedrich-Ebert-Stiftung (FES) have been working in close cooperation but were divided into two separate departments. In 2018, it was decided to reunite the both of them. Against the background of this process, the maturity model of digital transformation was developed for both, libraries and archives as a comprehensive approach.

Its dimension locates the digital transformation in the management area where it should be part of a superior strategy. The maturity model for digital transformation is an approach for its contextualization within this strategy and thus should be considered as one method among others. It is a tool in a tool box that gives insight into the libraries and the archives status to consolidate and prioritize next steps.

As there are several fields that are affected by the digital transformation, the maturity model covers 4 dimensions: technologies, processes, organization, employees. It is designed as a self-assessment questionnaire with a six-step-range ordinal scale that identifies strengths and weaknesses. The result of this self-assessment enables to highlight the different levels of progression within and among these dimensions and lays the foundation for further conclusions.

Keywords: digital transformation; maturity model; management; organizational change

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1. Introduction

The digital transformation is one of the major challenges these days as it is not limited to certain processes or fields of interest. Rather digital transformation can be regarded from a holistic point of view as a process with several dimensions. All in all, an overwhelming part of what characterizes the profession of librarians and archivists are concerned. Online services, customer interaction via social media, digitization of analogue materials, long-term preservation of digitized and born-digital documents are partly variations of familiar functions, partly new challenges that come along with needs of qualification and reshaping business processes. These exercises often need to be solved against the background of restrictive budgets. So the management of this transformation requires a dedicated set of methods in order to do the right things and to do them right. Therefore, a maturity model for measuring the status of the digital transformation can be a helpful tool to identify subjects that are more advanced than others to prioritize and manage them.

In the following, it will be outlined in short why a maturity model was developed at the Archiv der sozialen Demokratie (AdsD) as there are some special circumstances. To reunite both library and archives with their traditions, collections and staff seemed to be a unique situation that took place within the ongoing process of the transformation into the digital sphere. Anyway, the maturity model that was developed is independent from any of these circumstances and sought to be adaptable on any institution in the field of cultural heritage. This paper therefore will outline the basic approach and the dimensions of the model and avoid any inferences on the AdsD.

Furthermore, some general aspects of the digital transformation and its key term information will be explicated as they have influence on the way work is organized. Characteristics of maturity models and its transfer to information science will provide comprehension on the model that was developed as a comprehensive approach for libraries and archives. The model itself has the appearance of a checklist, which will be presented together with some notes on its evaluation. A visualization to enhance analyzing the results is proposed by presenting three diagrams.

Finally, a conclusion will summarize the concept and main benefits of the maturity model and concentrate on aspects for its further use.

2. Reuniting Library and Archive of Social Democracy

The AdsD exists since 1969 but has a tradition that goes back to the early days of the socialdemocratic party in Germany (SPD) in the 1860s. The AdsD is committed to its history but not limited to the SPD. In fact, its scope is broader and dedicated to the social democracy, which also comprises artefacts from or over the unions and further organizations and personalities from the international

and national labor and social movement. The AdsD is a part of the Friedrich-Ebert-Stiftung (FES), a political foundation, which is sharing ideological ideas with the SPD but is independent from it.

For many decades, the library was part of the archive of social democracy. In 1984, the library and the archive of social democracy became independent working units in one department under the umbrella of the FES. More than 30 years later, in 2018 it was decided to reunite both library and archive as one department as it used to be for the longest time (Bungert, 2002).

Today the library is keeping more than 1 million media items while the archive is holding more than 56 kilometers of records plus lots of audio-visual materials such as posters, postcards, photos, videos, films, audiotapes (Archiv der sozialen Demokratie, 2006). Since the millenium change, born-digitals are becoming more important and with the webarchive the AdsD takes care of a new media format since 1999 (Schmitz, Schefbeck, 2008).

Within a process of reorganization it became obvious that digital transformation is a crucial development to take into account as its characteristics needed to be harmonized. The checklist was developed as a component for the investigation of the level of digital transformation in different dimensions that was used as a self-assessment tool for both, archive and library. The assessment itself was conducted independently by the two working units. Therefore, one person per unit with an appropriate overview was chosen for this investigation and also the following ones in the future to ensure consistency of the assessment, which inescapably is to some degree subjective. Results were compiled in one chart, which then was evaluated in four steps that are explicated subsequently.

Findings resulting of this assessment were the basis for changes and strategic decisions within the process of reorganization among further reasons as this process was executed with a holistic approach. However, establishing a department for infrastructures and digital policies that is not limited to the boundaries between archives and libraries did not confront with the given results. Conclusions of the assessment became main parts of a paper for the further development of the institution's objects concerning its digital transformation, which is linking to the general strategy deriving from AdsD's vision "AdsD2025".

So, in a hierarichal sense the outcomes were integrated into the shaping of the strategy on a superior level. Furthermore, some practical measures derived from it, because they were obviously necessary and fitted into the strategy. Referring to this last point, the gain in knowledge was quite small, but at the same time proof of some desideratum was given. The use of the maturity model and the self-assessment thus headed into two directions but mainly aimed and was useful for the process of elaborating strategic ideas and a plan.

Generally speaking, challenges on a professional level for the AdsD are the same as for the most libraries and archives as well as the question about their role and position in society (Müller, 2021; Audunson et al., 2020). What probably distinguishes the AdsD from many other institutions is the close connection to the science of history institutionalized by the section Public History. In fact, products and services distilled in AdsD's integrated strategy process are crossing the boundaries between libraries and archives as well as they are accompanied by own efforts on promoting and conducting research.

The organizational changes are far-reaching and their implementation needs time while digitization nevertheless is an ongoing and infinite process. As part of AdsD's management toolbox, checking the digital maturity will be one tool among others to get orientation about the way to go and to assure that this way is followed. Therefore, it is planned to repeat the self-assessment early in 2022 next time.

3. Digital transformation and the information age

Digital transformation in its entirety is subject in the academic discussion on business administration and can be regarded as a growing field of interest. However, research on knowledge and information management dates back to the 1960s (Barbosa, Murici, 2019: 222-223).

It is obvious that there is strong emphasis on the business model according to dramatic shifts in economy that can be observed these days. Companies that are dominant in traditional industrial sectors need to rearrange supply chains or find other ways to interact with their customers. Companies based on information technologies are stepping onto the stage and, in some cases, are becoming strong competitors of established ones. However, the use of information and communication technologies (ICT) is not limited to executing administrative tasks. Digital transformation in this sense goes beyond digitization, which describes a process of information converting from an analogue to a binary-coded status (Chanias, Hess, 2016: 3). In its core, digital transformation is a phenomenon, which is driven by technological developments that enable innovative products and services with disruptive impact (Hess, 2019: 19-20).

Digital transformation sometimes is seen as inevitable and irreversible which of course lacks proof (Krcmar, 2018: 7-8). Nevertheless, its effects are not limited to economics but can be stated in nearly all spheres of society and public life. The main resource is information, the oil of our times, as a well-known saying states. The capabilities to process information–software and applications–are significantly important (Dumeresque, 2014: 1). Acquiring and analyzing data seems to be an advantage over competitors and is becoming the main key to improve operating models (Iansiti, Lakhani, 2016: 3-4).

The terms information age or information society indicate the connection from

this general development to the field of information science, where discussions about several aspects of this digital shift are taking place for many years. New services and expectations are generated and show proof of this reflection. With regard to a system of four categories about the speed and state of digital mastery in industry the place where cultural heritage institutions are located is still to be identified. But the normative reference given by the categories beginners, conservatives, fashionistas and digital masters indicates a ranking that is based on research giving evidence on the connection between digital awareness and economic effects (Westermann, McAfee, 2012; Westermann, Bonnet and McAfee, 2014: 22).

With regard to cultural heritage institutions, characteristics of the information age have slightly different impact than on the industrial sector in the economy, as there are no production chains to assemble e.g. a car. Labor is highly intellectual and bore specialization that was connected with humans. Staff members of museums, libraries and archives became specialists in their fields, which was good for their position and professional advancement. Obviously, for the institution itself there were some disadvantages. The means of data storage and processing are raising these isolated islands of information. Information is becoming available for anyone within an organization and thus establishes a basis for a division of labor in intellectual sectors like in cultural heritage institutions (Boes, 2018: 31-34; 38-41).

There is no necessarily conclusion that specialization will come to an end rather than specialists will be enabled to cooperate. This will change the working culture, which will have to become much more coordinated. Due to the importance of technologies, methods like agile project management may become accepted as well. Participation and the empowerment of teams will be accompanied by a culture of tolerance for mistakes (Hess, 2019: 179-182).

The change of the working culture can be seen as a part of general aspects of the organizational structure and condition. As a whole, this is a major dimension when speaking about digital transformation. The improvement of business processes, including the development of new ones, is another field of interest as are human resources. Finally, technology as the main driver must be taken into account. These are the four dimensions of the maturity model for digital transformation in cultural heritage institutions that are even corresponding to barriers in adapting digital technologies and transformation processes (Barbosa, Murici, 2019: 231).

4. Maturity models of digital transformation

The maturity model of digital transformation was developed with respect to existing models that are fairly common in economics, but with the special demands and requirements of information science. The dimensions listed above cover the most important aspects for libraries and archives. However, the

approach is selective and does not necessarily need to fit to all needs of any institution. Chanias and Hess conducted a survey about digital transformation maturity models in which they identified a range between 2 and 16 different dimensions. To measure a dimension requires a set of indicators that are both, precise enough to have an information value and sufficiently universalized. Mostly there is no external perspective that could result from a customer's point of view (Chanias, Hess, 2016: 4; 7-8). In summary, the selection and arrangement of items, dimensions and respondents are crucial and can cause biases with heavy influence on the result. Especially not considering customer's perspectives can be avoided by further investigation on the customer relationship, which is to be combined with the results.

The assessment of companies or institutions to measure the status of the transformation process or–as is sometimes called: the digital readiness–often is part of consultant portfolios and thus the models and their methodologies are not open source. As far as can be stated, the variety of methodological approaches is huge, ranging from simple scale to complex calculations (Chanias, Hess, 2016: 5).

Given this heterogeneous initial position, the digital maturity model for libraries and archives has an approach that is low-threshold and should be compliant to the following requirements:

1. The dimensions and indicators should be encompassing the situation for libraries as for archives. It should fit to their special needs and thus drill down general assumptions.
2. It is supposed that a market orientated strategy with an adequate business and operating model doesn't meet the position of libraries and archives entirely since they are non-profit organizations. A digital strategy that reflects these circumstances thus is not part of the maturity model but presupposed.
3. The maturity model should be an accessible, helpful and applicable tool and not be an exclusive part of a consultant company's portfolio. By discussing the model within the community it is even expected to improve.
4. The former point implicates that it should be handled by self-assessment. The methodological approach of quantifying the parameter values should be on a basic level.

5. The digital transformation maturity model for libraries and archives

The digital transformation maturity model covers 4 dimensions and therefore uses 19 indicators. Technologies as the main driver are taken into account first with questions about the overall ICT infrastructure at the office and for mobile working, but also about specific hard- and software for digitizing newspapers, posters, photos, videos, films etc. As a crucial point, the equipment with software

for cataloging and digital long-term preservation is also addressed. Online services for customers like cataloging systems, finding aids and digital copies are taken into account. The last indicator refers to data and metadata formats, which are sought to be standardized and interoperable to ensure that they are not bound to a certain hard- or software.

The second field of interest leads to business processes as they are a key for changes that are provoked by digital developments. As mentioned above, transparency and accessibility of information enables new and cooperative working. Therefore, business process models give insight and also indicate contact points with customers. Finally, workflows for digital long-term preservation as the major challenge and change of paradigm are appropriate means for measuring the status of digital transformation.
The organization itself is in the center of the third dimension. On the one hand, its constitution and financing with regard to the special costs of ICT infrastructure and security indicate important frame conditions for a successful perspective in the long-term. Additionally, there is a group of questions that refers to the working culture.

The last dimension of the model deals with the staff and asks for ICT competencies, the possibilities for on the job trainings and special knowledge in digital long-term preservation. Finally, it should be assessed whether the overall number of employees is sufficient for fulfilling the institutes mandate without undermining professional standards.

The self-assessment uses a scale consisting of 6 steps from the worst (1) to the best (6) value which means that a higher value states that the organization is more compliant to this criteria than with a lower one. To totally disagree the value 1 should be filled into the form while 6 means totally fulfilment.

Table 1: checklist digital transformation for archives and libraries

	Indicators	**Scale**
1	**Technologies**	**1 2 3 4 5 6**
1.1	The ICT infrastructure of the library/ archive with hardware (PCs, storage media etc.) is sufficient.	**1 2 3 4 5 6**
1.2	The ICT infrastructure with hardware for the digitization of analog artefacts (records, books, newspaper, poster, photos, film, video, audio etc.) is sufficient.	**1 2 3 4 5 6**
1.3	The ICT infrastructure with domain specific software (cataloging, digital long-term preservation etc.) is sufficient.	**1 2 3 4 5 6**
1.4	The ICT infrastructure for mobile working (laptops, vpn-connections etc.) is sufficient.	**1 2 3 4 5 6**

1.5	Online services for customers (cataloging systems, finding aids, digital copies etc.) are accessible.	**1 2 3 4 5 6**
1.6	Data and metadata have standardized and interoperable formats.	**1 2 3 4 5 6**
	Summary technologies	
2	**Business processes**	**1 2 3 4 5 6**
2.1	Business processes are transparent and comprehensible.	**1 2 3 4 5 6**
2.2	Business processes are modeled and put into graphs.	**1 2 3 4 5 6**
2.3	Communication with customers is executed by electronic means (email, social media etc.).	**1 2 3 4 5 6**
2.4	Workflows for digital long-term preservation are developed.	**1 2 3 4 5 6**
	Summary business processes	
3	**Organization**	**1 2 3 4 5 6**
3.1	The library/ archive can guarantee the operation of its ICT infrastructure personally, financially and organizationally.	**1 2 3 4 5 6**
3.2	The ICT security is compliant to common and approved standards.	**1 2 3 4 5 6**
3.3	The organizational structure enables for flexible reactions on new developments.	**1 2 3 4 5 6**
3.4	A participative working culture is cultivated and promoted.	**1 2 3 4 5 6**
3.5	Digital transformation is considered as an executable function with high priority.	**1 2 3 4 5 6**
	Summary Organization	
4	**Employees**	**1 2 3 4 5 6**
4.1	Participating in on the job trainings is welcome and promoted.	**1 2 3 4 5 6**
4.2	Employees have knowledge of digital office work.	**1 2 3 4 5 6**
4.3	Employees have knowledge of digital long-term preservation.	**1 2 3 4 5 6**
4.4	There is a sufficient number of employees for fulfilling the institutes mandate without undermining professional standards.	**1 2 3 4 5 6**
	Summary Employees	
	Overall	

Although being an ordinal scale, the arithmetic mean is calculated for each dimension. The results don't claim to be interoperable, but to indicate fields or dimensions that have higher and/or lower values and thus enable prioritizing

management decisions. Analyzing the results of this self-assessment first of all enables to compare the different dimensions among each other. It must not necessary be serious if there is a discrepancy between one and another dimension. On the contrary, this could be an expectable outcome in accordance to a superior digital strategy. When interpreting the results it should also be taken into account that there are interconnections. There may also be spikes within one dimension.

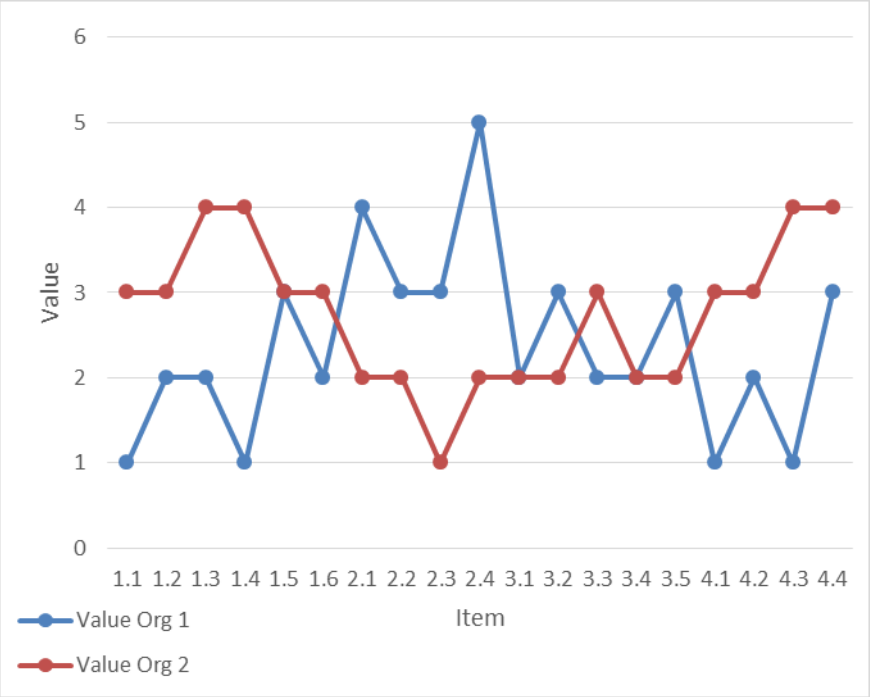
Heterogeneity as an outcome must not be better or worse than homogeneity. It should be further considered that the scale, although being ordinal and not indicating intervals, could be used as a benchmark. Being part of an overall strategy, for example it could be claimed that no single parameter value should be 3 or worse. This obviously depends on the situation of the institution that is examined and cannot be generalized.

A stringent progression in interpreting the findings can be done by following 3 steps that are explicated. As a completion a fourth step also is outlined which refers the AdsD's specific situation of reuniting archive and library and generally should be undertaken if different working units were regarded separately. This requires substantially discrepancy in the organizational constitution that have impact on other dimensions.

1. The analysis illustrates findings first with regard to the dimensions themselves. Obviously, several items indicate a need for further efforts in some areas. These are specific topics that can be picked up in adequate manner with regard to the overall strategy of the institution. E.g. a need for advanced training in long-term preservation can be part of a comprehensive human resources development program and does not necessarily need to be treated as a separate management task. This, of course, depends on the findings and the related urgency and importance.
2. Abstracting from the level of single items the average of each dimension can be interpreted. Generally, the results are divided into three categories: an average of 5 and onwards do not indicate any urgent need for action. Results in the range of 3 and 4 are most crucial, because they obviously showed some weak points that could not be mistaken as just a particular requirement. On the other hand, urgency certainly would be expected with the range of 1 and 2 and therefore have a high priority.
3. The comparison of the four dimensions with their average values is the next step to check whether there are zero to four urgent fields for further development.
4. Finally, if the examination is conducted separately for several working units that are somehow connected with each other as was the case for the AdsD a comparison of these findings offers an overview of the gap between them.

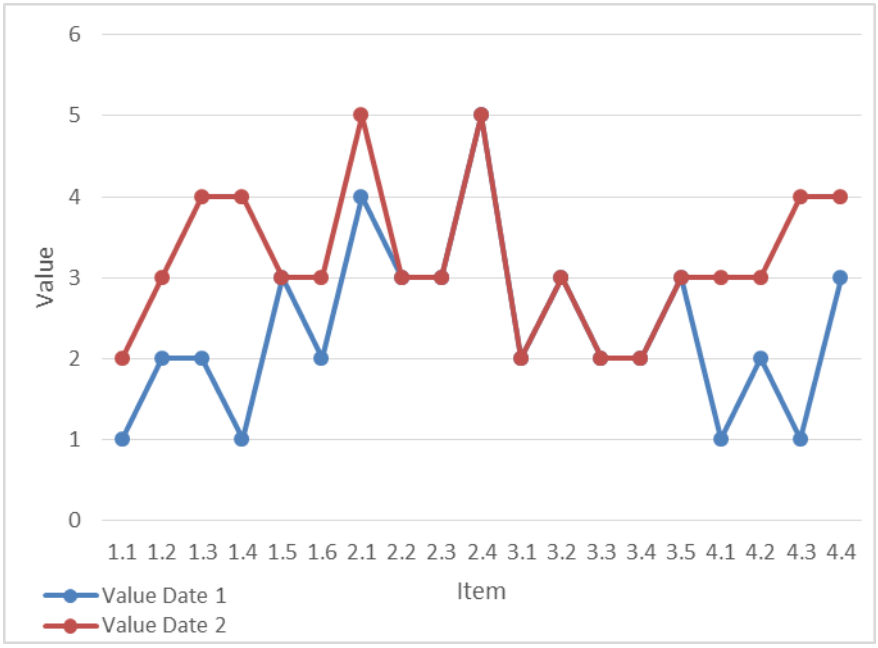
It is suitable to transfer the results into a visualization to identify and compare specific manifestations of the items. With regard to common maturity models different types of graphics and diagrams can be stated (Chanias, Hess, 2016: 5-6). A line chart is an easy to use type of diagram that for the sake of illustration is presented in the following with values that are fictional. This chart works well even for the case that more than organization or working unit are inspected.

Diagram 1: Analysis of 2 organizations on item-level at 1 date



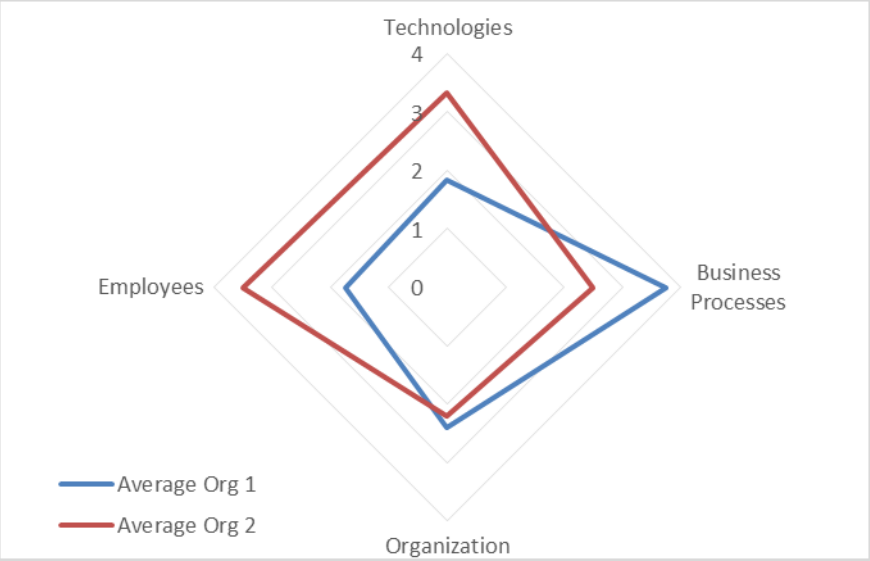
Aggregating the item-level to average values as proposed in steps 2 and 3 offers an overview that can be achieved by transmitting the data into a spider chart. Again, more than one working unit can be regarded that way and effectively be compared. The larger the form that will be the graphical result the better is the overall state, while a square will indicate an equal development at a glance. In particular, the consistency of an organizations status in digital transformation becomes evident.

Diagram 2: Analysis of 1 organization on item-level at 2 dates



Obviously, both diagrams work perfectly well for long-time observation as is advised. Development can be displayed in a transparent way and become integrated into e.g. annual reports or strategic papers with a minimum of explanation which may be useful for negotiations with stakeholders. By adapting the model to new requirements that may driven by technical or further developments analyses on the item-level cannot claim to be comparable over time any more. At least, as far the dimensions themselves are kept stable but measured with new indicators sustaining a long-term perspective is desirable.

Diagram 3: Analysis of 2 organizations on dimension-level



It is useful to include the results into a digital transformation strategy as the main topics are covered as follow-up. A framework as proposed by Hess (2019) or a leader's playbook like Westermann, Bonnet and McAfee (2014) suggest may give advice. Though the challenge will be to consider developments as referred by the mentioned frameworks in accordance to the specific situation of cultural heritage institutions.

6. Conclusions

At the beginning it was claimed that the digital transformation is an overwhelming process that affects libraries and archives in many kinds. As cultural heritage institutions, online services for research or access to digitized materials are expected by customers. Communication and public relations are taking place on different–mainly digital–channels. In accordance, new workflows must be developed, business process be reshaped. In addition, digital cultural heritage raises fundamentally new problems than the analogue artefacts. All these tasks must be operated by employees that need adequate skills and an organizational setting that is respondent to this change.

The characteristics of the information age are affecting the business and the operation model of profit-oriented companies, but also of libraries and archives. Maturity models are a common method in economics and, as was outlined, can be adapted for libraries and archives. They give an overview about the digital readiness and point out strength and weaknesses. Four dimensions were identified that reflect cultural heritage's peculiarities and requirements:

technologies, processes, organization, employees.

This digital transformation maturity model is an easy to use tool for self-assessment. It gives insight into the status of each dimension but also indicates the values of single items. The results lay the foundation for further courses of action and decisions. But it does not give advice on *how* to solve the challenges as it is limited to finding out *what* should be taken into account. Therefore, the digital transformation maturity model is one tool in a management toolbox.

As the digital transformation is a multilevel process that affects libraries and archives on many ways with different speed it is suggested to repeat the self-assessment from time to time. At least with regard to products and services offered it would be feasible to interrogate customers with a set of indicators on digital transformation to encompass their point of view. It can serve as a panel survey which offers options not just in analyzing but also in evaluating the steps and changes that were made. This model may also be adapted to suit specific needs better. Dimensions as well as indicators may be modified. At least with respect to technological changes in the future there will obviously a need for adjustment.

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