Exploring Centralized, Decentralized, and Hybrid Approaches to Micro-Credential Issuance in HEI Alliances

Padmasheela Kiiskilä[a] and Henri Pirkkalainen[b]
Tampere University, Tampere, Finland

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Abstract: Micro-Credentials (MCs) are seen as a way by Higher Education Institutions (HEIs) to equip learners with the essential skills for their careers or professional development. In Europe, HEIs are joining forces to form alliances to offer a broad range of MCs and make them tamper-proof, verifiable, and shareable. Although extensive research is being done on MCs, there is a major research gap in identifying and comparing different ways alliances can manage issuance of MCs. We identified two approaches in practice and through a case study, identified a third approach alliances can utilize. This paper also addresses this gap by using the data governance contingency model to provide a comparison of all three approaches that alliances can utilize in selecting the most suitable one for their business strategy. To achieve this, a qualitative case study is conducted with in-depth interviews with administrators from HEIs that are partners of an alliance. This study contributes to the governance of MCs through identification and comparison of the three approaches - centralized, decentralized, and hybrid in the context of MC issuance by HEI alliances.

1 INTRODUCTION

In recent years, interest in micro-credentials (MCs) has been on the rise for multiple stakeholders, including higher education institutions (HEIs). Multiple alliances have formed in Europe, consisting of HEIs and other institutions to pilot MCs at different levels (ECIU, 2023; ENHANCE 2022; Una Europa, 2022). MC governance depends on management of data, processes and technology within an alliance (Doering et al., 2022). Current research focuses mostly on the implementation (Abdullah & Ghazali, 2024), security and recognition (McGreal, 2024; Saad et al., 2024), and affordances (Reed et al., 2024) of MCs but discussion on issuing MCs is limited to technology used such as blockchain (EBSI, 2022; Kiiskilä et al., 2023) and platforms (Saad et al., 2024). Two approaches, as referred in this study as hybrid and decentralized, can be found from practical examples (ENHANCE, 2022; SDG Campus, 2024; Una Europa, 2022) for MC governance by alliances. In the hybrid approach, one or more partners in the alliance issue on behalf of all partners and in decentralized, each partner issue on their own.

However, empirical studies evaluating different approaches for MC governance in alliances including how to issue MCs that satisfy the MC recommendations are missing.

Issuing MCs require knowledge of data such as student data, MC data, institutional data and processes to use specific technologies such as EDCL platform. Through knowledge management, alliances can develop the required processes to offer and issue MCs that might not be possible as individual institutions (Jiang and Li, 2009). The complexities of HEI alliances, combined with the need to use platforms and the data residing in multiple systems in multiple HEIs need to be taken into consideration for MC governance. MC governance in an alliance can also depend on the scope of the alliance (Oxley and Sampson, 2004).

Traditional data governance involves structured data managed locally (Al-Ruithe, 2018) and presume that the same model can fit any organization (Weber et al., 2009). While research on using contingency factors to find the right data governance approach is available (Chelliah et al., 2016; Lee et al., 2017), empirical studies evaluating contingency factors

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[a] https://orcid.org/ 0000-0002-6347-9595
[b] https://orcid.org/ 0000-0002-5389-7363

relevant to alliances issuing MCs is missing. Moreover, current studies do not address how these contingency factors can be used in choosing the right approach for MC governance in an alliance setting. To address these research gaps, the following two questions are studied:

RQ1: *What are the different approaches alliances can issue MCs to their students?*

RQ2: *Based on the data governance contingency factors, how do different approaches compare for an alliance to issue MCs?*

Through the qualitative case study, we present a new centralized approach that is currently not utilized in the issuance of MCs by alliances. Taking inspiration from Weber et al.'s (2009) contingency model, the factors for the governance of MCs are identified and used for comparison of all three approaches in issuing MCs by alliances. Because issuing MCs, especially by alliances, is a rapidly growing practice-based area with limited theoretical understanding, we chose qualitative approach to gain a deeper understanding of this important area for HEIs.

The present paper contributes to MC literature by identifying a third approach that alliances can use and also to compare the three approaches for issuing MCs by alliances using data governance contingency factors. As a practical contribution, this can help HEI alliances understand the pros and cons of the three approaches to issuing MCs using the data governance contingency model. The rest of the current paper is organized as follows: Section 2 provides a theoretical background related to MCs and data governance models. Section 3 presents the data collection and analysis, which is followed by the findings in section 4. Section 5 covers the discussion and conclusion.

2 BACKGROUND

2.1 Micro-Credentials

After an extensive effort that was coordinated by the European Commission, MCs have been defined as *"the record of the learning outcomes that a learner has ac-quired following a small volume of learning"* (European Commission, 2022). Along with these efforts, the frameworks, and related technologies of MCs (DCC, 2023; Digivisio, 2023; MicroHE, 2021) started developing, and the metadata that they should contain have been described (European Commission, 2022). Within the context of HEIs, most of the literature focuses on the content, importance, and implementation of the MCs (Flynn et al., 2023;

Oliver, 2019). Although some studies have explained the features needed in MC platforms, (Kiiskilä et al., 2022), and new technologies are emerging to facilitate some of those features such as tamper-proofing and verifiability (EBSI, 2022; EDCL, 2022), there is a limited understanding of how they can be used in an alliance setting for MC governance.

Most of the literature is focused on what type of MCs are offered by the alliances (Shanahan and Organ, 2022), why alliances offering them benefit learners and HEIs (Romiță et al., 2021) and recognition of MCs (Ashizawa et al., 2024). From knowledge management perspective, literature also covers how alliances can be a differentiating factor in offering unique products such as MCs (Parise and Sasson, 2002), how alliances can leverage strength from the partners to create new opportunities (Inkpen, 1998) and governance adaptation at alliance level (Reuer and Zollo, 2000). Literature on how alliances can issue MCs and their strategy for MC governance is, however, limited to a few practical examples (Una Europa, 2022; ENHANCE, 2022). There are two approaches that can be seen in these practical examples for alliances to issue MCs.

(a) Hybrid approach: One or more of the alliance partners issue MCs on behalf of all the partners. This requires one or more of the partners to develop a system internally to issue MCs for all the partners (Una Europa, 2022). It includes a system in place for alliance partners to offer the MCs in a mutually agreed platform or their own internal platform (SDG Campus, 2024) and clear path for students how to apply for the MC (credential portion) when they successfully complete it.

(b) Decentralized approach: Each partner issues their MCs. In the decentralized approach, the MCs might be offered through the alliance, but each partner need to develop the MC issuance system internally or use commercial systems such as BC Diploma (BCDiploma, 2023). The decentralized approach is similar to existing practices in HEIs in issuing study records to students coming to their institution to study a single course or a fixed amount of time for mobility (Cuzzocrea and Krzaklewska, 2023). While in normal mobility programs, regular study records are issued to students from other HEIs, for MCs partners need to either enhance their existing systems or partner with external systems to issue MCs.

In both cases, issuing MCs should include the requirements such as making them tamper-proof, for example, by using an electronic seal to sign the credentials (eSealing). Depending on a variety of reasons such as institutional or national strategy for MCs, institutional bandwidth to enhance existing systems or partner with external systems (Kiiskilä et al., 2023), these options might not work for all alliances.

2.2 Data Governance

Data governance can be described as a framework of policies, processes, and guidelines for managing data as a strategic enterprise asset (Abraham et al., 2019). It specifies rights and accountabilities for an organization's decision-making about its data (Khatri & Brown, 2010). Different frameworks have been proposed with a focus on traditional IT assets (Weill and Ross, 2004), and domains relevant to data (Khatri and Brown, 2010; Otto, 2011).

Possible data governance approaches include centralized, decentralized and hybrid (Asgarinia et al., 2023; Colona & Jaffe, 2016; Xie et al., 2024). Although most of the data governance models presume the same model can fit any organization, Weber et.al. (2009) proposed a model that takes contingency factors into account for data governance. By using these contingency factors, organizations can determine the right data governance approach (Otto, 2011). The data governance model for any organization depends on the external and internal organizational factors that determine the organizational context related to data governance (Otto, 2011). According to the Weber's contingency model (Weber et al., 2009), a specific data governance configuration needs to be designed so that it fits the organization's context factors. It consists of two distinct parameters (a) organizational placement of data quality management (DQM) activities and (b) coordination of decision making for DQM.

However, the factors proposed by Weber do not consider external contexts such as platforms used by organizations. For institutions and alliances to issue MCs, platform(s) are a key component and so the governance factors related to platforms should also be considered. Lee et al. platform governance model (Lee et al., 2018) is an extension to the Weber model that includes factors specific to organizations using platforms. For this case study, we adapted Weber's contingency factors and two of the factors from the platform governance model namely, Open strategy and Platform maturity that contribute to the MC governance. For alliances offering and issuing MCs, open strategy can open the platform for multiple use cases and platform maturity ensures strict data governance.

3 DATA COLLECTION AND ANALYSIS

A case study was conducted with an alliance of multiple HEIs offering MCs to students of the alliance partners. At the time of data collection, there were 12 HEIs in the alliance from 12 different countries throughout Europe. All the partners were already offering courses through the alliance and issued a certificate of completion, along with the required academic transcripts to the students.

Multiple sources have been used for data collection, here following the recommendations of Yin (Yin, 2009). These include internal documents, project documents, white papers, and external documents such as platform documentation. However, data from the interviews are the major source. 19 individuals in administrative roles were interviewed. The interviews lasted between 28 and 63 minutes, with an average of 52 minutes. The interviews were conducted remotely using Microsoft Teams and were recorded with the permission of the participants. Furthermore, all the institutions participated in an early adopter program with EDCL.

All the interviews were transcribed. The research approach can be considered as an interpretive case study (Elliott & Timulak, 2005). In the present study, the three coding procedures proposed by Strauss and Corbin (1990) were used: open, axial, and selective coding. NVivo software was used to identify concepts from the interview transcripts. The incident(s), action(s), or event(s) from the raw data were given conceptual labels (Strauss & Corbin, 1990). Then the identified concepts were compared with the emerging theories and the most relevant and acceptable concepts were categorized. These categories were further developed into subcategories, ensuring the existence of linkage between them.

The two approaches, named in the present study as hybrid and decentralized, were derived from the practical examples as mentioned in section 2, and the third approach is derived from the empirical analysis. The contingency factors were used as influencing factors in providing the comparison of all three approaches for MC governance.

4 FINDINGS AND ANALYSIS

4.1 Approaches for Credential Governance

As described in section 2, the issuance of MCs can happen in two ways for alliances. (a) Hybrid approach, where one or more of the alliance partners issue MCs on behalf of all the partners or each partner issues their MCs. (b) Decentralized approach which requires all the partners to build the capability to issue MCs. *In our case study, during the EDCL early adopter program and our interviews it became evident that no one institution from the alliance would like to take the responsibility to issue for other institutions nor have the capability to issue MCs.*

It became clear that neither hybrid nor decentralized approaches would work for this alliance. This resulted in the need to identify a different approach to offer and issue MCs for alliances such as the one in the present study. Based on the empirical analysis, a third approach is identified:

    (c) Centralized approach: The alliance seals and issues the MCs on behalf of the partners.

The centralized approach requires the alliance to have a central platform to offer and issue the MCs. This platform becomes the central management and governance entity for all the MCs offered by the alliance. The central platform becomes the repository of all the MCs offered by the partners, ensuring all the information required to issue a MC is captured. This approach requires the central platform to provide a way for the partners to indicate when students complete the requirements to issue the MCs. The central platform also needs to have a mechanism to re-issue the same MCs if the need arises in the future.

4.2 Contingency Factors for the Governance of Credentials

4.2.1 Comparison of Approaches

To understand and evaluate the best approach for the governance of MCs by alliances, the contingency model was applied. As discussed in section 3, the contingency factors include both organizational as well as platform context factors. Table 1 shows the comprehensive contingency factors and the comparison of all three approaches.

Certain contingency factors such as the degree of market regulation stay the same for all three approaches because, irrespective of how the MCs are issued, all the data regulation policies need to be

followed. The centralized approach provides an open strategy because the platform is specifically designed to offer and issue MCs and customizing to a different market is easier. Similarly, it is easier to expand the portfolio of MCs offered in the centralized approach because it is a cumulative effort of all partners. The quality of the portfolio can be higher in both hybrid and centralized approaches because interoperability and uniformity are inherent.

Table 1: Contingency factors and comparison of the three approaches for MC governance.

Contingency factor	Hybrid (A)	Decentralized (B)	Centralized (C)
Performance strategy *(High<->Low)* *Quality* *Growth*	High Low	Low Low	High High
Diversification breadth *(High<->Low)* Portfolio/Market	Low	Medium	High
Organizational structure *(Centralized<->Decentralized)*	Centralized	Decentralized	Centralized
Competitive strategy *Branding (High<->Low)*	High	Low	High
Process harmonization *(Global<->Local)*	Semi-global	Local	Global
Degree of market regulation *(High<->Low)*	High	High	High
Decision making style *(Hierarchical<->Co-operative)*	Hierarchical	Segmented	Co-operative
Platform maturity *(Robust<->Scalable)*	Robust	Scalable	Robust & scalable
Open strategy *(Open<->Closed)*	Closed	Closed	Open

4.2.2 Case Study

The contingency factor matrix shows the comparison of the three approaches to issuing MCs. The alliance in the present case study chose centralized issuance as the best approach because it solved the issues identified earlier and opens other opportunities. As mentioned in the previous section, none of the partners in this alliance were ready to take up the responsibility of issuing MCs on behalf of all the

partners, and not all the partners were ready to issue MCs on their own. When asked for preference in the method of issuing MCs, administrators from all the partner institutions responded with a unanimous vote for the centralized issuance of MCs. The reasons included administrative ease and control over what is issued.

"Administratively, it makes much more sense to have a centralized process and to have one place that issues all the credentials and has the control of accreditations and all the parameters that you need to issue the credentials". - National co-ordinator.

Administrators felt issuing from the central platform would ensure all the MCs would be consistent. Each institution can provide the same information for all the MCs that can be stored in the central platform.

"It would make it equal and not different from each university". – Chief consultant

Institutional strategy and the work needed to convince and organize is another factor mentioned by administrators. The strategic vision for the alliance and making it a good user experience for the students were at the top of the list for all institutions.

"If you look at the administrative process, then centralized would be better because it is much more work if you have to organize this within your own university". – Educational consultant

Another factor mentioned by administrators is branding. It helps with the strategic vision and branding of the alliance as the individual institutions can focus on offering high-quality MCs under the alliance brand.

"Centralized marketing, centralized administration, enrolment, record, and storage, and so on". – Teacher and work package contact for MCs.

The alliance being a legally registered entity, acquired a Qualified eSeal and acted as the "issuer" of MCs by eSealing them, and the institutions offering the MCs as the "awarding body". In every MC, an evidence statement confirming the issuer and awarding body roles and responsibilities was included by EDC.

To facilitate this, the alliance added an addendum to its existing accord for recognition of credits. stating that all partner institutions agreed on the alliance to eSeal and issue all the MCs on behalf of the partners. This addendum was saved on the central platform server and a link to that document was included in every MC. This new ability to let an alliance issue MCs on behalf of all the partners also led to identifying steps in the MC process and responsibilities at the institutional and central alliance levels.

4.2.3 Potential Barriers for Centralized MC Issuance

Although numerous advantages were cited for issuing MCs centrally by the administrators, certain limitations also exist in the approach. The platform is central but there are no IT pipeline integrations done from partner institutions to the central platform to streamline data transfer. Therefore, all the relevant information for MCs including content related information, and admissions requirements for each MC, need to be entered into the central system manually. This includes the mandatory information to be included into a MC such as learning outcomes, description of the course, and workload. This can be time-intensive and requires dedicated resources from each institution to manage the information.

Because most of the MCs offered by this alliance can be formal and credit-based, the grade was an important factor to include in MCs. Due to lack of IT integration, they need to be entered manually by each institution into the central platform. Grades are sensitive information for a student and so a decision was made not to include grades in the MCs as it is considered too risky and error-prone to enter them manually. Since the students need a proof of completion including the grade to receive credit in their own institution, all the institutions still need to provide proof of grade, such as transcript of records. This renders MCs complementary to the existing process, a digital proof of participation and not replacement of current study record

Even though students register to a MC in the central platform, the admission process is done by the institution offering the MC and students receive access to their learning management platform. Since the MCs are created and issued from the central platform, there is a need to establish the identity of the students to ensure the MCs are issued to the right students. A process was established to obtain the level of security for the students either from their home institution or the host institution who is offering the MC by conducting an identity check. In cases where host institutions do not conduct an identity check if partner students register and home institution doesn't have an established process to set the security level for the students, the level of security remains low which results in MCs not issued to those students. This requires either an additional workload for IT team in the institutions or an additional process to be followed in the central platform to do manual identity checks for those students with low level of security through video chats. This adds additional burden either on the institutions to ensure the level of security

is added or on the central staff to perform manual checks. This may also increase privacy and security related issues for the students with additional identity checks.

Centralized issuance of MCs can add additional privacy and security related governance issues and need to be carefully considered including discussions with data protection officers and designing comprehensive policies.

5 DISCUSSION AND CONCLUSION

5.1 Theoretical Contributions

The first key contribution is the identification of a new approach in the context of MC issuance by alliances. Studies have examined MCs and their potential in various fields for career development (Vordenberg et al., 2024) and possible hurdles in implementing them from HEI perspective (Raj et al., 2024; Saad et al., 2024). Issuing MCs is discussed only as an end to means rather than as an important influencing factor (Alsobhi et al., 2023; Halim et al., 2024) especially in the case of alliances. Few studies that are available on alliances offering MCs (Ipsilandis et al., 2024) focus on dynamics of alliances themselves. MC governance required to issue MCs is critical and needs thoughtful consideration for the success of alliances in offering MCs. The two approaches we identified through practical examples work for certain alliances but not for all. Factors such as an individual institution's ability to issue MCs and willingness to take the burden of issuing MCs on behalf of all the partners determine whether either of the approaches can be used. Alliances where neither option is viable are left with no solution. With the centralized approach that we identified, alliances can consider building a central system and using the alliance legal entity to eseal and issue MCs for all the partners. This gives the institutions the flexibility to build the capability of issuing MCs in step with their institutional strategy. This centralized approach for the alliances to issue MCs has not been used in practice or studied to our knowledge. This contributes to the MC literature to include different approaches for MC governance.

The second key contribution is the comparison of the three approaches in the context of MC issuance. Although the three approaches namely: hybrid, decentralized and centralized can be found in existing literature in the data governance context (Coche et al.,

2024; Lemieux et al., 2020), the same cannot be applied to MC governance. Existing studies offer knowledge about technology to use for MC governance (Subramanian et al., 2024). Studies involving governance in alliances also discuss about governance mechanism that promote knowledge sharing (Eden et al., 2011) and how governance form can enable partners to develop, transfer and protect knowledge (McGill, 2007). However, our findings illustrate that in an alliance setting, who and how MCs can be issued using the technology is still needed. To meet requirements such as making the MCs tamper proof and include certain information mandatory in each MC, every alliance needs to look at how management and governance can be done and choose the right approach for them. This paper provides an understanding how the contingency factors from data governance can be used to find the right approach for any given alliance. To the best of our knowledge, this is one of the first studies to provide a comparison of all three approaches in the context of MC governance which includes issuing MCs. This contribution extends extends the MC literature to compare different approaches alliances can take. This also contributes to the data governance literature to use contingency factors in determining the right approach for alliances to take.

5.2 Practical Contributions

The findings make practical contributions by explaining 1) reasons why certain approaches such as hybrid and decentralized, might not meet the needs of some alliances for MC governance and 2) provide comparison of approaches from data governance perspective so alliances can make informed decisions. MC research has lacked empirical studies that could inform alliances different approaches feasible for MC governance or how to choose the right approach. Only a handful of practical examples are available and the approaches from those examples, don't necessarily fit for all alliances as was evident from the findings. The present case study presents a centralized approach for MC governance and a comparison of all three approaches provided in this study from data governance perspective can help alliances when considering the right approach for their MC governance.

5.3 Limitations and Future Research Topics

The present study has certain limitations that warrants further research. First, the interviews were done

during spring 2022, when MCs were still new for the administrators who were interviewed. However, all the administrators had considerable knowledge of the early adopter program in which the alliance participated in and helped in understanding the institution's ability to issue MCs at that time. Second, the comparison of the three approaches was done specifically, with a focus on the issuance of MCs by the alliances. Upcoming studies should also explore the validation of these approaches for other business strategies. Third, the contingency factors considered for the case study were specifically for an alliance of HEIs. Further research is needed to better understand the influence of contingency factors on data governance for other types of alliances as well. Fourth, the alliance in this case study is an established entity with an existing history. Further research is needed to understand whether a similar approach would work for alliances that form just for a single project.

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