The Dynamics of Transformation in the Development of Digital Services

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Abstract

Service providers are increasingly depending and using digital infrastructure and tools provided by digital platforms to transform their services and develop digital ones that meet the needs of heterogeneous end users. However, while there is an emerging literature of developing digital services, little is known about the dynamics of transformation. Using multiple cases of firms that develop digital services, the digital service taxonomy was synthesized to understand the dynamics of transformation in developing digital services. This study identifies five main dynamics: the services experience, the service process, the service capabilities, the service environment and the service delivery. Each of those dynamics and their associated factors is explored under the objectives of business, interaction and technology. This enables us to extend the existing literature on digital service development in particular and contributes to the research of digital innovation in general.

Keywords: digital services, service transformation, platforms, ecosystems, development

1. Introduction

The last few years have witnessed a tremendous increase in the value of digital services in the form of 'applications' or 'apps' [17, 21]. This value is recognized by various stakeholders within digital ecosystems such as owners of digital platforms, developers, partners and users [9]. These digital services have a very significant role in building the business around digital platforms [9, 18, 25]. They will address the needs of the heterogeneous end users [1, 11], and build a competitive advantage over platform competitors [26, 37].

Digital transformation of services involves the digitalization of services from analogue to digital and the change of the actual process generated by digitization [3]. In so doing, the provider of services is applying new technologies that improves the performance of their provided services and increasing their reach to new potential markets and customers [15]. This is a challenge for service providers and their ability to renew the way they make use of digital resources. Thus, service providers must develop and build new methods to develop digital services in the form of 'applications' or 'apps' [21]. This will involve a new envisioning of the customer needs and experiences [11], and operational processes [1] as well as other strategic assets. Although digital technologies are significant for digital service transformation, the processes, knowledge and experience of developing these digital services are equally important which is facilitated by the adoption of digital platforms and ecosystems [17, 6].

The subject of digital services in general and in platforms in particular has been discussed in a growing body of literature [7, 30], such as the evolution of digital services [34], the design of digital services [39], and challenges of in designing digital services [16]. However, little has been done to understand the dynamics of transformation when developing digital services by the service provider. To this end, the focus of this paper is identifying and discussing those dynamics associated with developing digital services. Hence, the research question is: *What are the dynamics of transformation for developing digital services by the service provider?* To address this research question, we have studied fourteen firms from Sweden, Denmark, Norway, Finland, Germany, UAE, Egypt and Jordan.

The paper was initiated with an overview of related literature and a conceptual discussion on the subject of digital platforms and ecosystems as well as the evolution of digital services. Then, this was followed by illustrating the research method, multiple case studies, data collection and analysis. Later the findings are presented in five different dynamics: the service experience, the service process, the service capabilities, the service environment and the service delivery. After that, the analysis and discussion of the dynamics of transformation in developing digital services were presented. Finally, the paper sums up the implications for research and practice as well as main convulsions.

2. Related Literature and Conceptual Basis

2.1. Digital Platforms and Ecosystems

The concept of 'platform' has been investigated by researchers in multiple domains [5]. In product development, researchers use this concept to illustrate products that are developed to meet core customers' needs within product family projects [13], while at the same time enable its ability to be changed and modified into derivatives [38]. This concept of 'platform' enables firms that are not essentially part of the supply chain to build, develop and design complementary assets [13], which is often observed in software development [6, 12, 14, 27, 36]. This concept of 'platform' is labelled as "digital platform" and is defined as "the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate" [34, p. 676].

The platform functionality is extended by incorporating digital modules [5, 29]. These modules are the developed digital services in the form of applications "apps" [33]. The developed digital services mainly contribute to the platform innovation by network effects reinforcement [19], growing the users installed base [31] and by addressing the requirements and specifications of the heterogeneous users of the platform [1, 11] and by enriching the digital ecosystem is formed to serve the digital platform [15].

The digital ecosystem is the functional unit around the digital platform that consist of actors (such as platform owners, development firms and users), and technology elements (such as software platform, boundary resources) which are mutually interdependent [16]. The different actors within these ecosystems are "inter-linked by a common interest in the prosperity of a digital technology for materializing their own product or service innovation" [31, p.184-185].

The owner of digital platform provides a digital marketplace or "appstore" to facilitate the exchange of digital services between users and development firms within digital ecosystems [37]. The digital marketplace is described as "a platform component that offers a venue for exchanging applications between developers and end-users belonging to a single or multiple ecosystems" [18, p.200]. It has a prominent role in matching the development firms, who aim to market and sell their digital services to users who pursue to use these services and enhance their smart devices with new functionalities [15]. These marketplaces also enable the digital transactions features such as service delivery, payments and trust [2, 20].

2.2.   The Evolution and Development of Digital Services

Digital services are code-based software modules that are attained and communicated through digital transactions [39]. These services are delivered to the users with the use of the Internet-Protocol (IP) and supported by technological infrastructure [34]. Digital services usually involve parallel transactions that are executed and implemented by the digital service providers. These transactions involve three main activities that include identifying, negotiating and handling the submitted requests from the users of these digital services [15]. Digital services are classified based on the type of users and service providers engaged and has three classifications: (1) business-to-consumer (B2C) (e.g., Netflix, Apple Music), (2) business-to-business (B2B) (e.g., SAP applications, Tableau), and (3) consumer-to-consumer (C2C) (e.g., Popcorn Time, Napster).

There is a dramatic grow of digital services the last few years in the form of applications "apps". They are referred to as platform digital services which are executable pieces of software that are offered as services to the end-users of digital platforms [17]. The development of these digital services aims at extending the digital platform functionality [29, 5], which is a significant innovation element besides their deployment in digital marketplaces "appstores" where these services are exchanged [18, 28, 35]. It is argued that the institutionalization of such digital services is a major success factor in the success of Apple's and Google's digital platforms. This kind of progression is labelled by [4] as "combinatorial evolution" of digital services. It includes the technological development in the form of digital service innovation "applications", technological development "platforms", market innovation "appstores" and hardware innovation "smart devices" [15].

The development of digital services is scientifically different from the development of other types of services. This is due to the availability of digital infrastructure [24]. Consequently, the development of such services goes beyond software development where engaged to 3rd party developers deal with multiple needs and specific requirements to develop digital services. To understand this, we have adopted [39] design taxonomy as in Figure 1 below.

	Objectives		
Design Dimensions	**Business**	**Interaction**	**Technology**
Service Delivery	Reducing costs	Mobility Scalability	Efficiency Bandwidth
Malleability	Adaptability opening new markets	Customization	Evolution
Pricing/ Funds	Value-added services	Optimizing Revenue	Commoditization
Service Maturity	Adoption & Scale	HCI standards	Towards full automation

Figure 1.   Digital service design taxonomy (Williams et al., 2008)

There are four fundamental dimensions for the taxonomy: service delivery, service maturity, malleability and pricing/funding. The service delivery describes how the developed service is provided to the users and what is required from the users to be able to use the service. The second dimension, service maturity tackles the various developed phases and the technical skills that are required. Third is the malleability, which explains the ability of the developed digital service to be malleable enough when market needs change and user requirements altered. The last dimension is pricing/funding which considers the value associated with the developed digital services and the various revenue capturing approaches.

There are three objectives of the service provider on this taxonomy: business, interaction and technological objectives. First is the business objective, which concerns the financial side of the digital service, customer loyalty and brand establishment and marketing. The second objective is interaction objective, which concerns the user experience part of the digital

service and the interaction design process. The third objective is the technology objective, which tackles the technology choice and the associated technical components when developing digital services.

This taxonomy is useful for digital service providers and 3rd part developers when developing digital services. The taxonomy provides a general understanding of the science of developing digital services and helps in maintaining a structured view of the development process. It also helps in understating how the development choices have direct impacts on the business, interaction and technical objectives of the digital service.

3.   Research Method

3.1.   Research Context and Case Selection

The research reported in this article is based on multiple case study methodology [40] of fourteen firms from Sweden, Denmark, Norway, Finland, Germany, UAE, Egypt and Jordan. The use of multiple case study is suitable for descriptive research studies, theory building and testing [8]. In addition, it is of a great value to extend theoretical perspectives and working with cross-case analysis [10]. In so doing, general research results can be achieved [8]. It is worth mentioning that evidences from the use of multiple case studies can lead to an overall vigorous and compelling generalized results [40]. Table 1 below illustrates general information about the studied cases.

#	Origin	Headquarter	Founded	Employees	#Digital Services	Interviews	Industry
1	Sweden	Stockholm	2007	14	2	2	Finance
2			2016	5	5	3	News
3		Malmö	2011	12	2	2	Entertainment
4		Gothenburg	2001	14	3	1	Health
5	Denmark	Copenhagen	2011	19	5	2	Education
6			2016	7	1	1	Travel
7	Norway	Oslo	2007	21	3	3	Finance
8			2014	8	2	2	Health
9	Germany	Berlin	2016	4	1	2	Education
10			2009	25	7	2	Finance
11	Finland	Helsinki	2008	12	3	1	Real Estate
12	UAE	Dubai	2012	16	3	2	Finance
13	Egypt	Cairo	2014	7	3	2	Shopping
14	Jordan	Amman	2014	10	1	2	Travel

Table. 1. Case Studies and Data Collection

3.2.   Data Collection and Analysis

Data for this research study was collected through several interviews, meetings, and secondary data sources in the form of documentations which is informed by the case study and the qualitative research approach studies [40]. The number of interviews collected was 27 from 14 different cases which range from at least 1 interview and at most 3 interviews per case as indicated in Table 1. All interviews were face-to-face, semi-structured with an average time of 80 minutes. The interviews were also recorded, transcribed and verified.

For this study, we have followed the inductive analysis approach [32]. This helped us in understanding the studied subjects without being forced to have pre-conceptions on data while at the same time having scientific integrity [10]. First, we established relations between codes and the current digital service development approaches by the studies case studies. Then, the

various events in the studies cases were folded chronologically [23]. This was done during the process of understating the development procedures of digital services in each case [22]. Last, we analyzed the views of development teams, how they worked with the development constructs and dealt with them from a development perspective

4.   Results

4.1.   The Service Experience

Data from our studied cases revealed that the service experience of customers when interacting with the provided services is very crucial when transforming services into digital ones. This experience forms the perception and feelings of customers when using and interacting with the provided services. Our study identified five types of interactions that shape the service experience. First, the Website Service Experience, Stefan a CEO in our studied case "3" explained:

> *Customers still visit our service website and explore it and they expect all content to be relevant and all information to be there and accurate. We are aware that we must provide two versions of our website, desktop one and mobile one so we can make sure we address all our users.*

Second is the App Service Experience. Data from all our studied case indicated that between 65%-85% of their users access the provided service via the digital service application or "app". Markus, a product manager at our studied case "8" stated:

> *At the beginning in 2010 we thought we could live by only providing the service in a mobile friendly website. We were wrong, the native app that we developed late 2011 was a hit as most of our customers are using it and it gives another type of experience.*

Third is the *Social Media Experience*. Using various social media channels become essential for businesses. We have found that all of our studied cases user at least three different social media channels to cope up with customers. A marketing manager from our studied case "9" illustrated:

> *Listen, I'm serious, we use, Facebook, Linkedin, Twitter, Snapchat, Instagram and YouTube. To form the whole experience of our service customers we must be wherever our customers are. Simply, they have to find us where they go.*

Fourth is the *Internet Bot Experience*. Seven of our studied cases reported the use of Internet Bot or Web Robot when interacting with their customers at some level. This enables them to perform simple interaction or structurally repetitive tasks that can save time, efforts and resources. A CIO at the studied case "14" explained:

> *Over the last three years, we studied all our customers' requests and develop some categories. We programmed our web bot and are able to deal with a lot of customers interactions without any physical intervention from our staff here.*

4.2.   The Service Process

The service process refers to the flow of activities and their mechanisms in which a service is delivered to the customer. We have identified three varieties of service processes while firms transform to provide digital services to their customers. We have found that the three identified services processes are experienced by all of our studied firms. First, is the *Standardized Service Process*. This type of service process includes a set of standardized activities that are performed the service customer. This type of service process allows the service provider to act and perform their operations with high efficiency. A COO at our studied case "9" explained:

> *We have been operating since 2000 in the insurance business. We experience those processes for example, initiating an incident claim. But when you go digital its totally different, old processes might differ, new processes that are not standard can become standard.*

Our study also revealed that the *Standardized Service Process* has three properties: (a) its identical (b) occurs frequently, and (b) easy to accomplish. This was explained by Martin a manager at the studied case "3":

> *These service processes occur in a daily base when our customer interact with our app and they are accomplished in a matter of minutes. If we are unable to develop them in a that manner we risk losing customers satisfaction as they are the core of our service.*

Second, is the *Semi-Standardized Service Process*. We have found that the second type of service process has the following properties: (a) semi-identical, (b) occurs less frequently, and (c) more complex than the *Standardized Service Process*. A product owner at our studied case "7" explained:

> *We have service processes that look similar to some extent but they are not. For this reason, we have to be able to handle them differently in our digital service while finding a common ground.*

Third, is the *Non-Standardized Service Process.* This type of service process is new to the digital service owners and they vary accordingly based on users' needs and behaviors. Our data analysis revealed that this type of service process is very complex and require a lot of attention by the service provider and it needs human intervention at some point during the service execution. This was emphasized by Martin a manager at the studied case "3":

> *These are the most complex ones, imagine you have 50,000 daily users who have changing activities.*

4.3.   The Service Capabilities

The service capability refers to the potential of a particular service to be developed and used. We have identified three main service capabilities that are significant for service providers and users in digital service transformation. First, is the *Technology Capability*. This type of capability considers the technology that is used to design and develop the service. Our data analysis revealed that the type of technology affects the user perception, interaction and behavior. Mathias, a CTO from our studied case "12" explained

> *I want to say that users are clever, many of them know if our used web-technology is old or new, slow or quick, secure or not. Thus, we are very selective when selecting a technology for our digital services.*

Second is the *Platform Capability*. We have found that the type of platform that the digital service integrates to is very essential in digital transformation. There are multiple platforms that are used and each of those platforms has its own capabilities and features. Our data analysis shows that all of our studied case designs their services to be integrated to at least two platforms. Adam, a CTO at out studied case "10" illustrated:

> *You know in UAE and Dubai in particular our user base is fragmented. This means we have iOS users, Android users and also a large amount use BlackBerry OS. So, we have to accommodate all users and work with three different platforms.*

Third is the *Hardware-Device Capability*. There are fragmentation of hardware and devices across platforms. For example, Apple's iOS has 25 devices, Google's Android 8,600 devices, Blackberry's OS 33 devices and Microsoft's Windows Mobile 132 devices. Findings based on our studied cases revealed that they have dealt with this differently to accommodate user needs. Naji, a CEO at our studied case "12" explained:

> *We are with a limited budget and we have to prioritize, we can't develop services for all Android devices, different screen sizes, resolutions, CPUs, etc. So, we have to pick up the most used devices by our users and accommodate them.*

4.4.   The Service Environment

The service environment signals the intended digital market segment and the positioning of the service. For example, a digital bank app indicates it is serving clients between 18-34 years old. Our data analysis identified three factors that determines the service environment. First, is the *User Experience*, which is determined by the user group, their skills and needs. We have found that 10 of our studied cases focus on one particular user group while the rest have

several user groups and deal with multiple *User Experiences.* Anita, a marketing manager at our studied case "7" explained:

> *We are focused on Millennials, so we develop a user experience strategy for those between 18 and 26. We studied them, what they like what they hate and design accordingly.*

Second, is the *Service Integration* which corresponds to the ability of the service to integrate other services from multiple suppliers. Our data analysis shows that the ability to integrate other services in the main provided service can determine the degree of adoption and amount of usage of a particular service. This was emphasized by Magdi, from our studied case "14":

> *Once we integrate social services in our app, the growth of user increased dramatically.*

Third, is the *Service Customization,* which corresponds to the ability of the service to be customized by its users. Our data analysis indicates that the degree of customization varies based on two factors which are the service industry and users. Peter, CTO, from our studied case "17" emphasized:

> *We deal with a complex user group that needs everything to be customized based on their need or even moods. We thought that's difficult but we have to deal with it.*

4.5. The Service Delivery

The service delivery signals the set of configuration and organizational networks that are developed to deliver services to end user that satisfy their needs. We have found that the service delivery of digital services is focused on digital application marketplaces as the main delivery channel and interaction point between digital service provider and digital service users. We have identified three main factors that play considerable role in the delivery of digital services. First, is the *Service Delivery Cost*, which determines the cost of the service after being delivered by the end user. The factor that we have found which is added to this cost is the commission rates or cut that is taking by the digital application marketplaces such as Apple's Appstore of Google Play. A marketing manager is our studied case "5" explained:

> *When we develop our services, we have to always increase the price to end customers because there is this huge cut that is taken by Apple and Google, add to this also the transaction cost when we receive our payments at the end of each month from them. In addition, sometimes we have to set our service free for Android users and paid for iOS users which might makes things complex little bit.*

The second identified factor is *Service Delivery Review*, which corresponds to the ability of end users to interact directly with the digital service provider and the other users via the digital application marketplace. This was explained by Martin, a manager at our studied case "8" illustrated:

> *Users can try our digital services or buy them. They have the ability to leave their reviews and rate us. This is very sensitive as these users are verified by the appstore and they are real users which are trusted by the other future users of our service.*

The third identified factor is *Service Delivery Infrastructure*, which identifies the set of technology infrastructure that are supporting the delivery of the digital service to end users. This was clarified by an IT expert from our studied case 6:

> *Pus notifications is one of the most important issue in our app business. It will let us send notifications to users via the platform and keep them updated. It is complex and cost a lot of money to maintain but it's very essential.*

5. Discussion

There are several dynamics that digital service providers work and consider with when developing services for their end users within digital platforms. Our empirical based understanding help in identifying five major dynamics at a service level: the service experience, the service process, the service capabilities, the service environment and the service delivery. Set of actors for each dynamic were also identified. These actors were classified and illustrated under three objectives: business, interaction and technology based on

the digital services taxonomy [39]. In the discussion below, each dynamic was thoroughly discussed and all of the associated factors were explained.

	Dynamics	Objectives		
		Business	Interaction	Technology
1.	The Service Experience	*N/A*	*- Social Media Experience* *- Internet Bot Experience*	*-Website Service Experience* *-App Service Experience*
2.	The Service Process	*-Semi Standardized Service Process*	*-Standardized Service Process*	*-Non-Standardized Service Process*
3.	The Service Capabilities	*-Platform Capability*	*-Hardware-Device Capability*	*-Technology Capability*
4.	The Service Environment	*-Service Integration*	*-User Experience*	*-Service Customization*
5.	The Service Delivery	*-Service Delivery Cost*	*- Service Delivery Review*	*-Service Delivery Infrastructure*

Table. 2. The Dynamics of Transformation in Development of Digital Services

5.1.   The Service Experience

Digital services providers are required to consider the experiences of end users when developing digital services. There are four main factors that have to be taken into consideration. Two of those factors are *Interaction* factors: first is the *Social Media Experience*. This identifies the degree of integration between the developed digital service and the various social media tools, technologies and networks that became a core part of the overall users' experience. The variety of the integrated social media channels and the degree of interaction using those channels will affect the use and the degree of adoption of the digital service by the end users. Second, is the *Internet Bot Experience*. It is found that this is an essential factor for interaction between service providers and service users within the digital service. Its importance lays in its ability for prompt feedback handling and follow up compilations.

The other two factors are *Technology* based. First is the *Website Service Experience*. It clearly indicates that the service provider has to address the needs of users based on the technology they used, for example, desktop web browsing and mobile web browsing. The second factor is the *App Service Experience,* which explains the necessity of developing an application based digital service in addition the web-based ones. This is due to the fact to the large number of end users who tend to use mobile devices for the consumption of their used digital services.

5.2.   The Service Process

The second dynamic that providers of digital services has to consider while developing their services in a transformation context is the *Service Process*. It entails the flow of activities and their mechanisms in which a service is delivered to the customer. Three factors have been identified. First, is the *Interaction* objective which considers the *Standardized Service Process,* that allows the provided service to be performed high efficiency due to its standardized manner that allows common and stable interaction with the end users. Second, is the *Business* objective, that corresponds to the *Semi Standardized Service Process* which is semi-identical, occurs less frequently which entails new business opportunity for the service provider. Third, is the *Technology* objective which entails the *Non-Standardized Service Process.* This type of service process is new to the digital service owners and they vary accordingly based on users' needs and behaviors. It needs the service provider to use an advanced technology to develop its services in accordance to this factor.

5.3.   The Service Capabilities

The third dynamic is the *Service Capabilities* which refers to the potential of a particular service to be developed and used. The *Business* objective for this dynamic regards the *Platform Capability* that determines to which platforms the service provider is integrating its digital services. For example, iOS, Android, Blackberry and Windows Mobile. These multiple platforms are used and each of those platforms has its own capabilities, features and business objectives. The second factor is *Hardware-Device Capability* which is associated with the *Interaction* objective which refers to the fragmentation of hardware and devices across platforms in which the digital services to be developed for and integrated in. The more hardware-device the digital service is integrated in the more the interaction between the end users and the service provider. The last factor is the *Technology Capability* which considers the technology that is used to design and develop the service. For example, XCode, Java, to name a few. The service provider has to determine the robustness, the performance, the adaptability and the efficiency of the used technology in developing the digital services.

5.4.   The Service Environment

This is the fourth dynamic and it signals the intended digital market segment and the positioning of the service. The *Business* objective for this dynamic regards the *Service Integration* factor that corresponds to the ability of the service to integrate other services from multiple suppliers which is very essential for the service provider to expand the growth of their userbase and to entail to different options of business models. The *Interaction* objective regards the *User Experience* factor which is determined by the user group, their skills and needs and is highly connected to the *Business* objective at the user growth level. Providers of digital services has to identify to what user group(s) they are developing their services in advance as this determination might affect the development processes and is recommended at early stages. The *Interaction* object regards the *Service Customization* which corresponds to the ability of the service to be customized by its users. In this regard, providers of digital services analyze their correspondent service industry and their end-users to develop and customize their digital service accordingly.

5.5.   The Service Delivery

The *Service Delivery* dynamic is a set of configuration and organizational networks that are developed to deliver services to end user that satisfy their needs. Its *Business* objective is mainly regarding the *Service Delivery Cost* factor that determines the cost of the service after being delivered by the end user. Providers of digital services have to take into consideration not only the cost of their digital service delivery but also the cost of the after-delivery cost. For example, in Apple's Appstore, there is the commission rates or cut that is taking by the digital application marketplaces to deliver the service and there is the In-App purchase to deliver other features after the digital service has been deployed for the end users.

Then the Interaction objective that regards the *Service Delivery Review* which is the ability of end users to interact directly with the digital service provider and the other users. Digital service providers have to be aware to develop interaction features that facilitate the review process by the end users of their digital services. Last is the *Technology* objective that details the *Service Delivery Infrastructure* which identifies the set of technology infrastructure that are supporting the delivery of the digital service to end users. Digital service providers have to work at different level of Infrastructure for example, platform level, ecosystem level and digital marketplace level to assure the delivery of their digital services to the end users as designed.

6.   Implications

The research study reported in this article has a number of implications. First, the perspective on digital services innovation extends the existing literature on digital service development in particular [7, 24, 39] and contributes to the research of digital innovation in general [34, 37]. Second, the reported results provide a new understanding on the development of digital services and illustrates new study agenda in digital ecosystems. This study identifies the four main dynamics that developers and providers of digital services has to take into consideration when developing digital services. Finally, this research contributes to the overall research stream in digital innovation and development [9] by identifying the dynamics and their associated factors that affect the process of developing digital services by service providers [15].

7.   Conclusion

In this paper, we studied the dynamics of transformation for developing digital services by the service providers by synthesizing the digital service perspective [7, 24, 39] while designing digital services for digital platforms [17, 34, 37]. The study was based on studying fourteen firms from Sweden, Denmark, Norway, Finland, Germany, UAE, Egypt and Jordan. We have developed an empirically grounded understanding of the dynamics. In addition, we have identified set of dynamics and associated factors and classified them under three objectives: business, interaction and technology. There are several limitations to our work that could be addressed through future studies. For example, studying develop digital services for specialized industries such as health-care or banking by focusing on one single unique case or multiple cases within the same industry.

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