

A Case Study on E-marketplace Basic Functions

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Abstract—This paper conducts a case study to demonstrate that the success of EMPs corresponds to their basic functions. Through selected cases (Knowledgestorm.com, Dell.com, Taobao.com, Alibaba.com, Wire-and-cable.cn, E2open.com, Bolero.net, Tradecard.com, Ariba.com), this paper shows that the proposed basic function set will be able to increase, if not guaranteed, the success of future EMPs. The main contribution of this paper is that it has verified that there exists a basic function set of electronic marketplace such that the subset of the basic function set can be utilized to customize any particular type of electronic marketplace.

Keywords—*electronic marketplace; case study; interoperability.*

I. INTRODUCTION

Electronic marketplace (EMP) [4][9][10] is a very important research area in the development of e-commerce technology. It is an inter-organizational market information system, or a common business information space that allows participants to do business through its provided functionalities [10]. Although EMPs becomes now more mature and stable, the increasing demand for online business calls for even higher interoperability between EMP participants and drives the need for more cost-effective EMPs [11]. To construct a higher interoperable EMP, the formula $I = F/C$ proposed by Guo [11] offers an essential EMP theory such that business interoperability (I) between EMP participants can be computed as a ratio between the number of effective EMP functions (F) and the coordination costs (C) of providing EMP functions. This implies that, the quantity and quality of EMP functions is an important measure of EMP interoperability.

To understand the constituent of EMP functions for the existing EMPs, An and Guo [2] made a historical survey on EMP functions. This survey found there exists an EMP Basic Function Set (BFS) distributed in a suggested EMP functionality classification model [12]. Based on the finding, it is argued that all EMPs as a whole must present such a BFS.

This paper agrees that there exists a BFS for all EMPs as found in the work of [2]. However, it further assumes that any type of individual EMP is constructed by a subset of BFS and such a subset is dynamically changing. The goal of this paper is to verify these two assumptions through a method of case study.

In the rest of this paper, Section II discusses the related work. Section III introduces the method of case study used in this paper. Section IV makes case studies along with the

research result. Section V, validates and interprets the findings. In Section VI, the limitation of this research as well as some implications are presented. Finally, the paper is summarized and a conclusion is made such that a successful EMP construction will contain a subset of EMP BFS adapting to any dynamic context.

II. RELATED WORK

A. EMP Basic Function Set

The research in [2] found a basic function set (BFS) of EMP through a historical literature event methodology [11] by collecting required historical data about EMP functions to Guo's EMP functionality framework [12], which, in essence, is an EMP function classification. This BFS establishes an interrelationship between EMP basic functions and function published year as well as function counted quantity. In BFS, each function has its own tendency curve and vertically belongs to a higher leveled function category. The purpose of BFS research is to show that functions are the indispensable elements for EMP construction, and that the evolved basic functions of EMP are meeting the demand for more interoperable EMP requirement.

B. EMP Types

While there exists a BFS of EMP, how an individual EMP is clearly typed by allocating a subset of the basic functions out of BFS still remains unknown. In practice, observations are made that an EMP can often be typed based on Electronic Market (EM) business model, industry scope, ownership, and technical construction method.

1) EM business model

Early in 1998, Timmers defined an EM business model as an architecture for product, service and information flow [35]. It contains three components [1] of content (exchanged goods and information), structure (the links between transaction stakeholders), and governance of transactions (the control of the flows of goods, information and resources). Dai and Kauffman [7] thought an EM business model consists of three dimensions of market functions, management needs, and technological adaptation. Though different, EM business models are mostly devoted to providing more mature functions for online business [10]. To make distinctions, Chou [5] divides online business participants into individuals, corporations and governments. This

enables to characterize EMPs based on transaction relationships between consumer, business and government [20]. For instance, EMP can be typed by the participant relationships of business-to-business (B2B) [14][22][25][27], business-to-consumer (B2C) [16][23][24][33], business-to-government (B2G) [5][8], and consumer-to-consumer (C2C) [21] [28].

2) *Industry scope*

EMPs can be classified as either horizontal or vertical [17] [29]. A horizontal EMP connects participants across industries. A vertical EMP serves the needs of a particular industry sector such as automotive, chemical, construction or textiles. Adopting a vertical EMP can reduce the cost and time along with a supply chain, thus enhancing working efficiency. According to [30][31], industries can be sorted as shown in Table I.

TABLE I. CLASSIFIED INDUSTRY WITH TYPICAL CASES

Industry Scope	Typical Cases
IT products and services	Intel, Dell, IBM, Ariba
Electronics industry	FastParts.com
Aviation	Exostar, Boeing
Transportation and logistics	PartsBase, Sailnet
Healthcare and pharmaceutical	Neofarma, Promedix
Agriculture	KDM International
Basic materials	DOW, Newmont
Construction and building	McCarthy
Education and knowledge	Wiley, McGraw-Hill
Financial services	Tradecard.com
Energy	ConocoPhillips, Shell
Hospitality	Ctrip
Forestry and wood	National lumber
Heavy manufacturing	BHP Steel
MRO/Office supplies	Qunaer
Industrial equipment and services	Qatarmark
Professional services	Delphion, Sportline
Retail/CPG/Wholesale	Alibaba ,taobao ,Sears
Government /Legal services	Go-business
Others	Google

3) *Ownership*

Unlike traditional market that is naturally existing, any EMP has its owners. The ownership of any EMP classifies existing EMP into private EMP, community (consortia) EMP and public EMP [6][11][18][19]. A private EMP is owned by a single legal person and is either buy-side or sell-side. A public EMP (also called an open EMP) is owned by an independent third-party other than buyers or sellers. A community EMP is owned by several key buyers or sellers or their established consortia, for example, Covisint, originally owned by three big automakers of Ford, GM and Daimler Chrysler.

4) *Technical construction methods*

An EMP is always technically constructed by a set of functions serving certain e-commerce purposes such that functions serve to satisfy a specific set of EM requirements. Function-based EMP construction has long been studied. Bakos [4] thought an EMP consisted of functions of matching of buyers

and sellers, transaction facilitation, and institutional infrastructure. Wang and Archer [36] suggested that EMP functions are classified into market-oriented functions (aggregation and match-making) and collaboration-oriented functions (transactional and strategic). Researches of [3][6][32] stated that market-oriented functionalities construct a competitive markets while collaboration functionalities construct supply chains that support and streamline the business processes between business partners.

Recently, Guo et a. [13] proposed an EMP technical construction method. They thought that an EMP is a particular breakdown of a subset of EMP functions in BFS [2]. A particular subset of BFS is an EMP technical construction type. All types can be enumerated as specific EMP technical construction methods, which are: e-catalogue, e-shop, e-portal, e-hub, e-switch, e-integrator, and e-merger.

III. METHODOLOGY OF CASE STUDY

A. *EMP case modelling*

An EMP case can be modelled for study based on EMP types. EMP type classifications help model formation, where a case can be modelled as a multitude of EMP types from several angles. For example, Skjott-larsen et al. classified EMP into four categories: horizontal and vertical EMP; buyer-side, sell-side and neutral EMP; fixed pricing and variable pricing marketplace; open and closed EMP [34]. Ordanimi and Pol proposed a classification of relation structure, degree of diversification and transaction operating mechanisms [26]. Kaplan and Sawhney classified EMP based on what and how businesses buy [17]. These analytical methods are useful yet fail to provide us with mutually exclusive EMP function sets that formulate strongly typed EMPs. To provide a strongly typed EMP, this paper selects four classic variable factors (technical construction method, ownership, business model and industry scope) shown in the Fig. 1 to reconstruct to model an EMP – a four dimensional model.

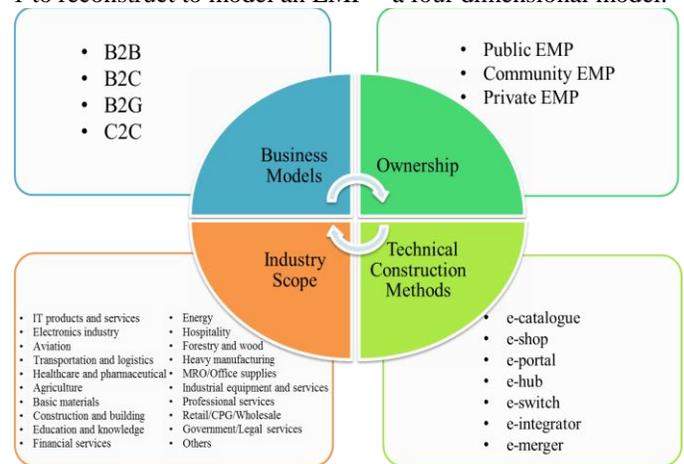


Fig. 1. EMP construction model

Based on the proposed EMP construction model, nine representative cases, shown in Table II, are selected.

TABLE II. TYPICAL CASES WITH FOUR MODEL VARIABLES

Construction Method (V ₁)	Ownership (V ₂)	Business Model (V ₃)	Industry (V ₄)	Typical case (URL)
e-portal	Public	B2B	IT products and services	knowledgestorm.com
e-portal	Private	B2B	IT products and services	dell.com
e-portal	Public	C2C	Retail/CPG/Wholesale	taobao.com
e-portal	Public	B2B	Retail/CPG/Wholesale	alibaba.com
e-portal	Public	B2B	Industrial equipment and services	wire-and-cable.cn
e-hub	Public	B2B	IT products and services	e2open.com
e-switch	Public	B2B	IT products and services	bolero.net
e-integrator	Public	B2B	IT products and services	tradecard.com
e-merger	Public	B2B	IT products and services	ariba.com

B. Method to case analysis

Two concepts are introduced to express the relationships between collected functions in the nine studied cases and BFS.

1) *Union of functions (U)*: The union of all the functions from the nine cases.

2) *Intersection of functions (I)*: The intersection of all the functions from the nine cases.

If U and I both belong to BFS between 1986 and 2012 [2], then it is concluded that BFS is a complete function set for any EMP to customize its construction. To find the functions historically appeared in nine cases, Wayback Machine [46] is adopted as the history web archival website, where all functions from 1986 to 2012 are collected. Since the history of EMP is as short as Web history, the most recorded Web pages at [46] are pretty robust in recording Web history and sufficient to represent the whole EMP development [11][13].

IV. CASE STUDY AND ANALYSIS

A. Case study

The nine cases, shown in Table II, are studied. They are all well-known and representative for EMP construction modelling as illustrated in Fig. 1. To analyze them, the nine cases are divided into two control groups. Control group one consists of three comparative samples, shown in Tables III, IV and V, with the same V₁ (e-portal) but different V₂, V₃, and V₄. Control group two, shown in Table VI, consists of different V₁, but same V₂, V₃, and V₄.

TABLE III. FIRST SAMPLE IN CONTROL GROUP ONE

V ₁	V ₂	V ₃	V ₄	Cases
e-portal	Public	B2B	IT products and services	Knowledge storm.com
e-portal	Private	B2B	IT products and services	Dell.com

TABLE IV. SECOND SAMPLE IN CONTROL GROUP ONE

V ₁	V ₂	V ₃	V ₄	Cases
e-portal	Public	B2B	Retail/CPG/Wholesale	Alibaba.com
e-portal	Public	C2C	Retail/CPG/Wholesale	Taobao.com

TABLE V. THIRD SAMPLE IN CONTROL GROUP ONE

V ₁	V ₂	V ₃	V ₄	Cases
e-portal	Public	B2B	Retail/CPG/Wholesale	Alibaba.com

e-portal	Public	B2B	Industrial equipment and services	Wire-and-cable.cn
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TABLE VI. CONTROL GROUP TWO

V ₁	V ₂	V ₃	V ₄	Cases
e-hub	Public	B2B	IT products and services	E2open.com
e-switch	Public	B2B	IT products and services	Bolero.net
e-integrator	Public	B2B	IT products and services	Tradecard.com
e-merger	Public	B2B	IT products and services	Ariba.com

B. Analytical Results

The cases of control group one (see Knowledgestorm [37], Dell [38], Wire-and-cable [39], Taobao [40] and Alibaba [41]) shows that (1) if the technical construction method is the same (e.g., e-portal in control group one), the EMP function set adopted has commonality for all EMPs even if they have different variables of business model, industry scope and ownership; and (2) Some functions appear not belonging to the e-portal EMP type and belonging to e-integrator type, which means that e-portal is evolving to a more sophisticated EMP type.

The cases control group two are selected with different technical construction methods, shown in E2open [42], Bolero [43], Tradecard [44] and Ariba [45]. The analytical result shows that different technical construction methods have different subsets of BFS for EMP despite of the same business model, industry scope and ownership. This verifies that each EMP technical construction method has its own subset of BFS for EMP construction.

V. VALIDATION, INTERPRETATION AND IMPLICATION

With the validation from the two control groups, functions are proven to be the indispensable elements for EMP construction. Furthermore, when compared with other three EMP construction classifications, technical construction methods based on functions have their own superiorities.

In order to meet the demand for highly interoperable and cost-effective EMP, Attentions should be more paid to basic functions. According to the studied cases, a best fit (least squares) linear regression is used to predict the tendency of all functions till the year of 2020.

$$\text{FORECAST}(x, \text{known_y's}, \text{known_x's}) \quad (1)$$

The parameter x shown in (1) must have a numeric value, known_y's and known_x's must be arrays or cell ranges that contain equal numbers of numeric data values. It shows clearly different results in Table VII separately in 2014, 2017 and 2020. Specifically, the function of license agreement will be the most popular one (11.81) in 2014. However, social network system (marketing) will replace license agreement as the top function (13.90 and 18.40) in both 2017 and 2020. With SPSS forecast results of the two basic functions shown in Fig.2, we can further validate this prediction.

TABLE VII. FORECAST RESULTS

Function	2014	2017	2020	Function	2014	2017	2020	Function	2014	2017	2020
Catalogue(marketing)	10.30	11.61	12.92	Billing	5.19	5.79	6.39	Credit Management	5.19	5.88	6.56
Advertising	11.54	13.10	14.65	Information Standardization	4.95	5.42	5.89	Availability	10.00	11.29	12.57
Social Networking Systems(marketing)	9.40	13.90	18.40	Social Networking Systems(sourcing)	5.10	6.20	7.30	Demand and Supply Forecast	3.16	3.96	4.76
Product Recommendation	8.76	9.90	11.05	Currency Exchange	1.13	1.15	1.17	Integrity	11.04	12.48	13.91
Search	10.51	11.95	13.39	Warehousing	1.00	1.00	1.00	Confidentiality	11.32	12.88	14.44
Catalogue(sourcing)	10.42	11.87	13.31	Transportation	3.85	4.30	4.75	E-police	3.55	4.00	4.45
Product Channel Analysis	10.02	11.71	13.40	Tracking	3.85	4.30	4.75	Privacy Protection	11.75	13.27	14.80
Financing	6.55	7.56	8.57	Customs Clearance	3.90	4.47	5.04	Intellectual Properties	8.43	9.62	10.81
Supplier Comparison	7.19	8.29	9.39	Quality Inspection	4.98	5.67	6.37	Duties and Taxation	5.13	5.75	6.37
Price Comparison	3.63	4.25	4.87	Insurance	5.00	5.58	6.16	Consumer Protection	10.12	11.44	12.76
Product Comparison	6.31	7.17	8.02	Order Management	6.67	7.56	8.45	License Agreement	11.81	13.38	14.94
Supplier Credit Management	4.68	5.57	6.46	Call Center	2.35	2.62	2.88	Cybercrime	9.79	11.59	13.38
Online Robot(helpability)	3.36	4.43	5.50	Online Robot(after sales services)	5.00	8.00	11.00	Jurisdiction	8.46	10.08	11.69
Help	11.79	13.47	15.16	FAQ	8.92	10.19	11.45	Trademark Protection	11.49	13.05	14.61
Product Review	11.64	13.24	14.84	Instant Message	2.37	2.36	2.35	Repair	1.00	1.00	1.00
Marketplace-made Regulations	11.75	13.27	14.80	Social Networking Systems(after sales service)	2.60	3.50	4.40	Other Laws and Regulations	10.96	12.23	13.51
Selling Products and Services	5.15	5.76	6.37	Digital Copyright Declaration	10.41	11.78	13.16	Payment	5.19	5.79	6.39
Buying Products and Services	3.65	4.04	4.42	Business Process Integration	3.71	4.08	4.46	Systems Integration	2.72	3.02	3.32
Value-added Services	3.86	4.38	4.90	Return	2.43	2.73	3.03	Application Integration	3.71	4.08	4.46
Auction	2.46	2.73	2.99	Claim	3.72	4.23	4.75	Service Integration	3.19	3.29	3.38
Inquiry	3.36	3.57	3.77	Customer Tracking	6.08	6.84	7.60	Replacement	3.80	4.40	5.00
Offer	3.36	3.57	3.77	Customer Behavior Analysis	6.28	7.18	8.08	Document Integration	3.48	3.72	3.96
Counteroffer	2.33	2.51	2.69	Marketing Channel Analysis	7.24	8.43	9.62	Vocabulary Integration	3.34	3.51	3.69
Acceptance	3.86	4.29	4.73	Supplier Analysis	7.17	8.07	8.97	Collaborative Design	3.13	3.75	4.37
Contracting	2.33	2.51	2.69	Product Comparison Analysis	7.09	8.06	9.02	Product Sharing	6.54	8.03	9.53
Tendering(Inc. RFQ)	1.00	1.00	1.00	Product Review Analysis	9.18	10.54	11.90	Information			

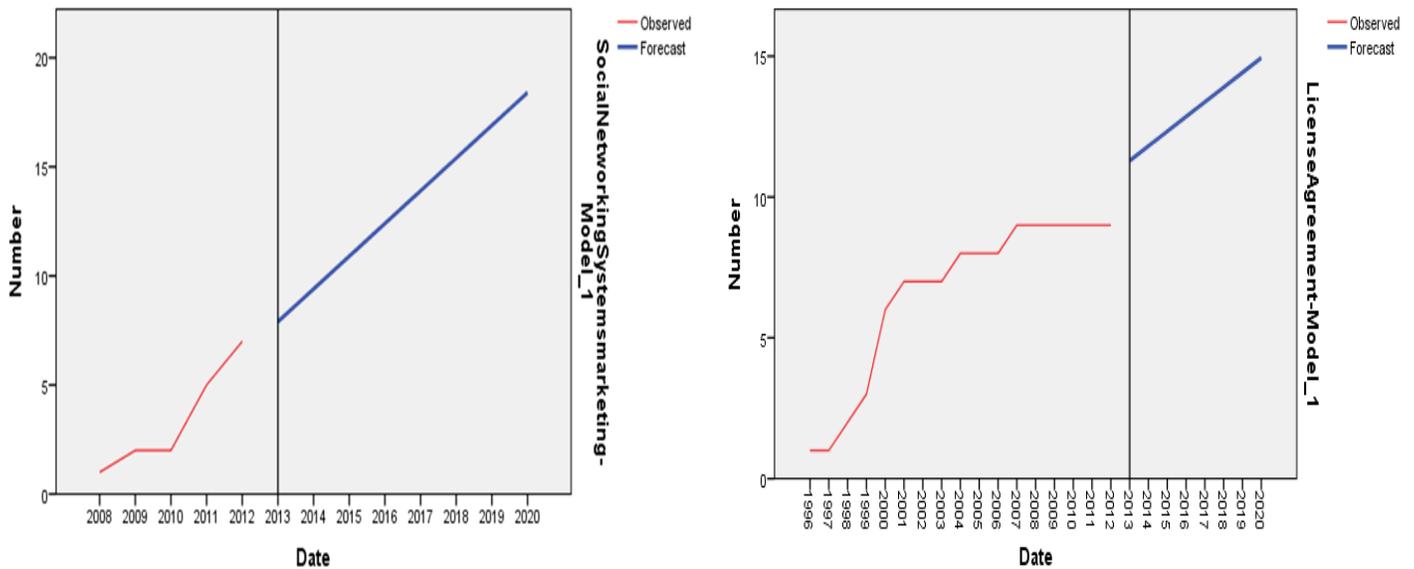


Fig.2 .Social network system (marketing) and license agreement SPSS forecast results

VI. LIMITATIONS AND IMPLICATIONS

Nowadays, smartphones and computers are intimately connected, and this new relationship will perhaps reveal some limitations of our study, because the functions we covered in this study are primarily based on official websites not mobile applications. For instance, take the case of Alibaba; QR Codes function is not included in our study.

Moreover, in the case of Taobao, the emerging Taobao University is also an important function, which produces a great number of e-commerce specialists. Similarly, Ariba University is able to help the participants with the skills and practices that will allow them to take advantage of all the benefits of the Ariba EMP solutions. Nonetheless, given the scope of this paper, the nine selected cases are very representative.

This paper has several important implications for the future development of EMPs. First, finding and updating the known EMP (BFS) is important. Second, mastering technical construction methods is a key to simplify the building of various types of EMP. Third, the EMP construction model has provided a guideline of customizing a particular EMP based on the given BFS and the forecasted functions.

VII. CONCLUSIONS AND FUTURE WORK

In a nutshell, the case study done in this paper has validated the EMP BFS proposed in the previous research [2] and also predicted the future development of each function until the year of 2020. Employing the methodology of EMP construction model proposed in this paper and the notions of union and intersection, all functions have been collected from the nine cases and have been found in the BFS. This research is a more comprehensive study, which has been combined with the previous literature-based research [2], to reflect the typical customer requirements and inherent functionalities for a successful EMP. It aims at higher interoperability and cost-effectiveness that meet the demand of a successful EMP. In future, the EMP construction customization will be studied based on the given BFS.

ACKNOWLEDGMENT

This research is partially supported by the University of Macau Research Grant No. MYRG069-FST12-GJZ.

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