

Developing a cloud EBC system with 2P-Cloud architecture

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It does not need to be mentioned that Business cards are essential for businesses and consumers alike across all industries irrespective of size of the business. Today, these cards not only help in giving contact details but building a brand. In digital era the business card is also going through the journey of digital transformation. While some of the expectation from such electronic business card can be articulated as – Easy to share, cost-effective, Eco-friendly, Easy to customize, store the information conveniently and contact management. While taking a closer look at these expectation the authors were convinced that such system should be based on a cloud architecture. The authors with their experience on the 2P-cloud Architecture realized that the concept can be extended for cloud services 4-tier architectures and an Electronic Business card system can be built on it. In this study, we proposal an instance of the cloud electronic business card (EBC) generation framework which is according to the Key point of view of Business models, Operational processes and User experiences of Digital transformation studied by Abhijit et al. and the five skills and competencies of CDO studied by Anna et al. and the 2P-Cloud architecture studied by Chuang et al as main. In this study, we focused on the system availability of cloud EBC system in the development processes, which is to attend the smooth process of Human–Computer Interaction when we design an IT system.

Keywords: 2P-Cloud architecture; cloud services' 4-tier architectures; cloud electronic business card system; cloud electronic business card generation framework; Digital tranformation; Human–Computer Interaction

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1. Introduction

The emergence and confluence of technologies like Internet, Mobile, social, big data and cloud have brought in new opportunity in the form of Digital Transformation for enterprise. Digital transformation is wholesale reimagining and reinvention of how business operates, enabled by today's advanced technology. It includes reshaping of existing business models and relooking at the business model, operational process and user experience.

The process of digital transformation began decade ago however there is not enough research regarding the realization of digital transformation projects yet. The Digital transformation is a transformation for the process, activity, model and Competency, for example, the traditional enterprises make E-commerce to strengthen existing Business but this invariably bring transformation to the existing organizational setup (in terms of strategy, Personnel

and mindset). A digital mindset is the key to successful transformation. It Includes use of digital tools and data technology to reduce job hours (i.e., automation of manual tasks), improve service quality, and optimize productivity [1].

The Chief Digital Officer (CDO) of a firm is focus on IT strategies and IT-enables innovations. The CDO must own five skill and competencies, such as, IT competency, Change Management Skills, Inspirational Skills, Digital pioneering Skills and Resilience [2].

In our paper we extend the application of cloud service systems for the commercial operations module by the 2P-Cloud architecture [3] point of view and present our case by establishing a cloud electronic business card system (cloud EBC system) based on cloud Services. The purpose is to provide a feature to allow user to connect to cloud EBC system and make an electronic Business Card via in-

ternet anytime and anywhere, when required. This will essentially reduce the cost and time to produce electronic business cards and improve the interactive efficiency of the commercial operations.

2. Related work

Capturing the value of digital transformation which includes - redesigning the customer Experience, Transforming Operating model and innovating the Business model to use Digital Technology to achieve business value which uses digital technology as business Value driver, would be the most important task of Enterprise Management (For example, Internet technology, Analytics and Mobility impacted by the digital transformation). The Key point of view of Business models, Operational processes and User experiences of Digital transformation is shown as below in Table 1 [1].

Table 1. The key point of view of Business models, Operational processes and User experiences of digital transformation.

Type	Key point of view
Business models	Reshaping existing business model thanks to market imperatives; Focus on the value propositions of customer; Extend market
Operational processes	Customer relationship; Vendor relationship; Sales; Delivery; Marketing; Knowledge management;
User experiences	Digital native and user maturity; Collaboration and Interaction;

A CDO of a firm must own five skills and competencies such as IT Competency, Change Management skills, Inspiration skills, Digital pioneering skills and Resilience as shown in Table 2 [2].

There are some different indicators in evaluating memory performance such as the Memory Balloon, Heap, State, Active, Shared, Usage, Consumed, etc. in virtual machine environment [4]. The Virtual Machine Monitor (VMM) computer was defined as a host machine and the virtual machine performing above as a guest machine [5].

The VMM can be considered as Host OS. VirtualBox V4.3.12 [4] to provide a virtual platform responsible for managing the operation of multiple Guest OS; for instance, CentOS V6.5 is used to share the hardware resource virtualized.

The 2P-Cloud Architecture was mainly used to apply x86 virtualization technology to deploy VMM on Pu-Cloud and to build multiple Pr-Cloud on the VMM. Pu-Cloud is considered as Host OS, and Pr-Cloud is regarded as Guest

OS; and to deploy application server on Pr-Cloud. The schematic diagram of Host OS managing multiple Guest OS is as shown in Fig. 1 [3].



Fig. 1. The 2P-Cloud Architecture

The evaluating performance metrics of virtualization in 2P-Cloud Architecture environment include the storage utilization, the memory, the CPU and to consider I/O devices performances such as the CPU Usage 34.2% in Windows Server, the CPU Usage 13.5% in Ubuntu Linux, the CPU Usage 18.1% in Window Server Ubuntu Linux. The 2P-Cloud Architecture can to integrate different application systems of numerous Cloud Platform as a Service (PaaS) into a PaaS to achieve the centralized management, ease to maintain and transplant and balancing efficiency of the server, promoting the use efficiency and safety of the cloud software and hardware resources, as well as obtain more flexible scheduling ability of PaaS [3].

The VMM has x86 processor with specific limitation in the term of hardware. The Pu-Cloud has the basic limitation of running multiple virtual machines situates in disk space and memory. The major software and hardware configuration details about Host OS and Guest OS of 2P-Cloud Architecture are shown in Table 3 and Table 4. In addition, Table 5 is the HDD partition schedule of Guest OS [3]. Digital transformation represents redefining customer experience, business models and operational processes, finding new ways to deliver value, generate revenue and increase efficiency. However, practical transformation also requires the support of innovative technologies.

In this study, we proposal an instance of the cloud EBC generation framework which is according to the Key point of view of Business models, Operational processes and User experiences of Digital transformation studied by Abhijit et al. and the five skills and competencies of CDO studied by Anna et al. and the 2P-Cloud architecture studied by Chuang et al as main.

In the key point of view of Business models, Operational processes and User experiences of Digital transformation, first business models must consider the inspiration skills and Resilience of the five skills and competencies of CDO and the feasible idea of EBC system using the 2P-Cloud architecture. Second, Operational processes must consider the Change Management Skills of the five skills and com-

Table 2. The five skills and competencies of CDO

Skills and Competencies	Practical Description
IT Competency	New digital products and services are based on Information Technology (IT), So CDO should understand IT applications and the underlying infrastructures, as well as knowledge on how they can be upgraded and modified.
Change Management Skills	The CDO must understand what new digital technologies mean for their businesses and customers. He also needs a comprehensive understanding of the operations of the different business functions. So, the CDO's task is both highly crossed functional and interdisciplinary and requires highly developed change management skills.
Inspiration Skills	As the driver of digital transformation, the CDO Should is able to convince and inspire all internal decision makers and employees about the need for digitally transform and demonstrate them the advantages. With the skill to inspire others, the CDO not only act as a consultant to the top management team, but also, as effective motivators of the whole workforce and thus, enable the digital transformation in the first place.
Digital Pioneering Skills	To inspire and motivate an organization to embark on a digital transformation, the CDO needs to act as a digital pioneer and vanguard, which require a high level of visionary thinking capabilities.
Resilience	To successfully complete the digital transformation task, the CDO needs to be resilient, particularly in "traditional" enterprises, because digital transformation will need substantial changes. In such enterprises, colleagues of CDO, both at managerial and at employee levels won't always readily accept the deep changes required for digital transformation.

Table 3. The major software and hardware configuration details of Host OS

Operating System	Windows 7 Home Basic
Processor	3.00 GHz
Memory (RAM)	3.00 GHz
System Type	32-bit
HDD	500 GB

Table 4. The major software and hardware configuration details of Guest OS

Operating System	CentOS 6.5
Processor	3.00 GHz
Memory (RAM)	1024 MB
System Type	32-bit
HDD	80 GB

petencies of CDO. Third, User experiences must consider also the Digital Pioneering Skills and IT Competency of the five skills and competencies of CDO. Final, we integrate the second step and third step to implement an EBC system based on the 2P-Cloud architecture. The related diagram for EBC generation framework is shown in Fig. 2.

3. Cloud EBC system architecture and human-computer interface

Considering the experimental natures of the research, Authors have adopted instance analysis and design to verify

the critical methodology of the Cloud EBC system extended application and adequately achieves the Cloud EBC system' key research objectives.

Base on the 2P-Cloud architecture [3], this research deploys LAMP on PaaS (Platform as service) mode for running the Cloud EBC system, and conducts the Cloud EBC system' development, design and testing.

We design the Client site tier, Web server tier, AP server tier and MariaDB server tier of cloud services' 4-tier architecture based on 2P-Cloud architecture. With 2P-Cloud architecture we can assign the web server load and a load balancing scenario would be achieved. The cloud services' 4-tier architecture of cloud EBC system is shown in Fig. 3. This study employed the 2P-cloud architecture being the server to run the EBC system: Host OS is considered as Pu-cloud on which the VMM can be installed; The VMM can be built on Guest OS which is considered as Pr-cloud on which operating system and EBC application server can be deployed. The correlated tiers of 2P cloud architecture include Client side tier, Web server tier, AP server tier and MariaDB server tier of the cloud services are shown in Fig. 4.

The cloud EBC system functionality can be segmented into five sub modules namely: Download Logo Subsystem; Choose the EBC draft style subsystem; Edit the EBC content Subsystem; Generate and Preview the EBC subsystem and Download or Delete the EBC subsystem.

Table 5. The HDD partition schedule of Guest OS

File system mount point	/	/home	/var	inapplicable
File system type		ext4		swap
Size (MB)	10240	8192	8192	inapplicable
Additional size options		Fixed size		Partition can be used to maximum

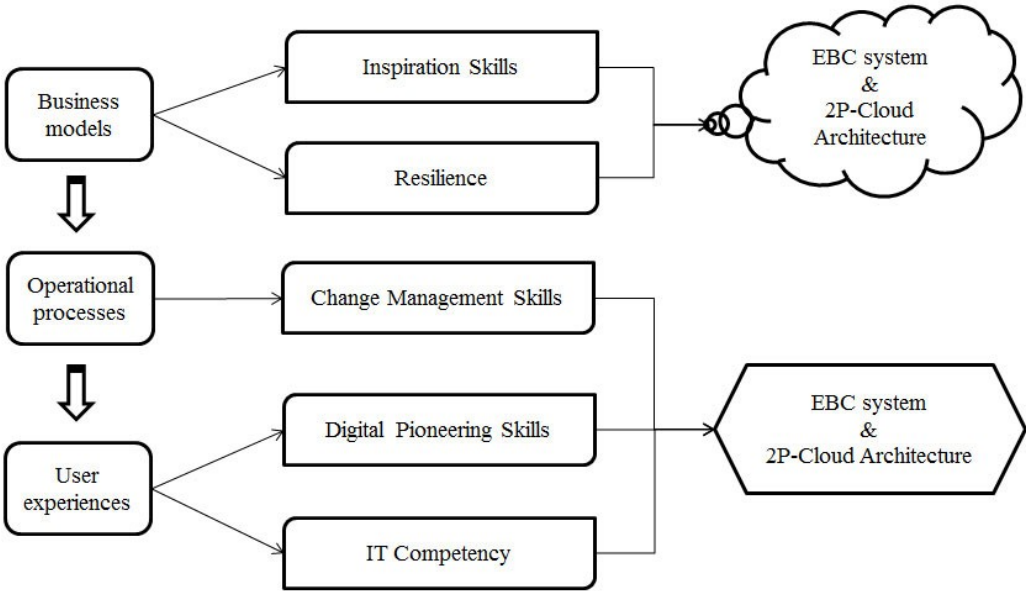


Fig. 2. The related diagram for EBC generation framework.

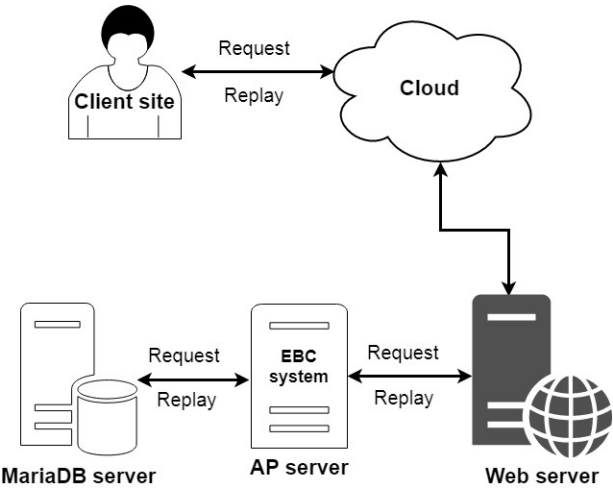


Fig. 3. The cloud services' 4-tier architecture of cloud EBC system

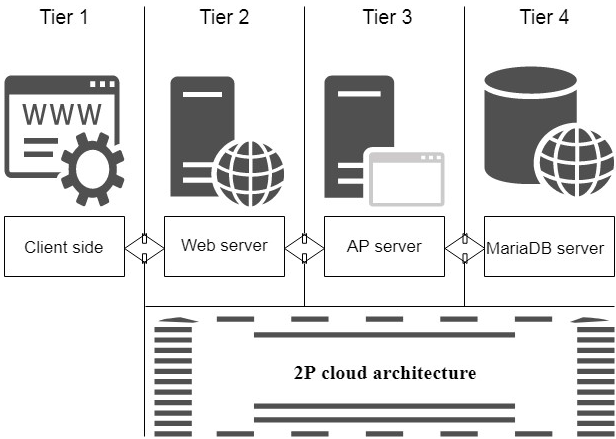


Fig. 4. The correlated tiers of 2P cloud architecture.

The five sub modules are implemented in cloud services' 4-tier architecture where the user uses Man-Machine interaction and send request through Web Services to different sub modules as per need.

The sub module will process the corresponding request and returns the result based on the data and the data stores in the MariaDB. Depending on the request a sub system comes into action. The function architecture diagram of cloud EBC system is shown in Fig. 5 and Fig. 6.

The Business Process Model and Notation (BPMN) is the standard for business process modeling that provides graphical notation for specific business processes in a business process diagram; it's also represents the standard graphical interfaces of interactive process between Human-Computer [6]. We have used standard the BPMN to implement the Business process of cloud EBC system. The human-computer interface interactive diagram of cloud EBC system is shown as below Fig. 7.

4. Design of cloud EBC system

We have used the pattern of Model, View and Control (MVC) to design the cloud EBC system, so that we can keep five sub-systems separated to design, and each module can be extended Maintained separately.

The preview analysis of cloud EBC system includes three phases: 1. The cascading style sheets (CSS) orchestration design – where we embed the CSS codes of cloud EBC system to the 'cart.tpl'; 2. Design a subprogram to cite the CSS of cloud EBC system requirement; 3. Adjust the whole layouts of 'cart.tpl' until typesetting normal.

For the codes design of cloud EBC System, we utilize the 'cart.tpl' program to finish 'HTML to Image' in the codes of 'View' model as shown in Fig. 8. In the Loop of 'foreach (productsasproduct)', adding a corresponding subprogram of 'HTML to Image' code to after the Loop of 'foreach (product['option']asoption)'.

In our study, to produce the design and typeset of electronic business card (EBC) has twelve elements, including the Background style image, Logo image, Company name, Department, Position, Name, Tel, Cell phone, E-mail address, Uniform resource locator (URL), Company address and QR code etc.

We can embed twelve elements in the EBC, and apply the CSS to orchestrate the EBC until the regular typeset of EBC. The CSS code of EBC is shown in Fig. 9.

The 'html2canvas' function allows us to directly take 'screenshots' of webpages on the browser of user, and we can use the 'jQuery Actions and Methods' to achieve the 'HTML to Image'.

In this study, we must design a corresponding subprogram of 'HTML to Image', that synthesize the user data and image to accomplish the production and downloading of EBC online. The corresponding subprogram code of 'HTML to Image' is shown in Fig. 10.

5. Result discussions

After completing the development of cloud EBC system, we had thoroughly validated the functionalities of cloud EBC system on the local host before deploying it over the PaaS. The homepage interface of cloud EBC system is shown in Fig. 11 and the interface of enter data and upload image as shown in Fig. 12.

In the preview interface of EBC, we can to download an EBC, which is to indicate that cloud EBC system has validated successfully as shown in Fig. 13.

In this study, a business card is £0.26, and we evaluated the return on Investment (ROI) for the cloud EBC system. We started with a hypothesis - A company has 100 Employees and it needs 1000 business cards for each Employee per year. So, if the company orders it via the similar print firm it will pay £ 26,000.

While for cloud EBC system the cost would come around £ 3.16/month per year, as we only would require to pay for the using fee for the cloud (rented unlimited traffic of advanced virtual host is £ 3.16/month per year). This would bring us to conclusion that the ROI on cloud EBC system would be around 685% as shown in Table 6.

6. Conclusions

The main aim of digital transformation is to get benefits of digital technologies, such as productivity improvement, cost reduction and business innovation. These technological innovations bring key procedure - the disintermediation procedure (i.e., peer to peer) with them, which will continue to influence the technological innovations of digital transformation.

In this paper, we have realized the cloud EBC system with the 2P-Cloud architecture. In this study, we focused on the system availability of cloud EBC system in the development processes, which is to attend the smooth process of Human-Computer Interaction when we design an IT system [7, 8]. With the developing advantages of 2P-cloud architecture, the cloud EBC system design methods and cloud services' 4-tier architectures are undoubtedly a successful instance of the new IT application.

In the paper, the development, analytics and services orchestration of cloud EBC system can be used as a reference of developing novel IT system in the future such

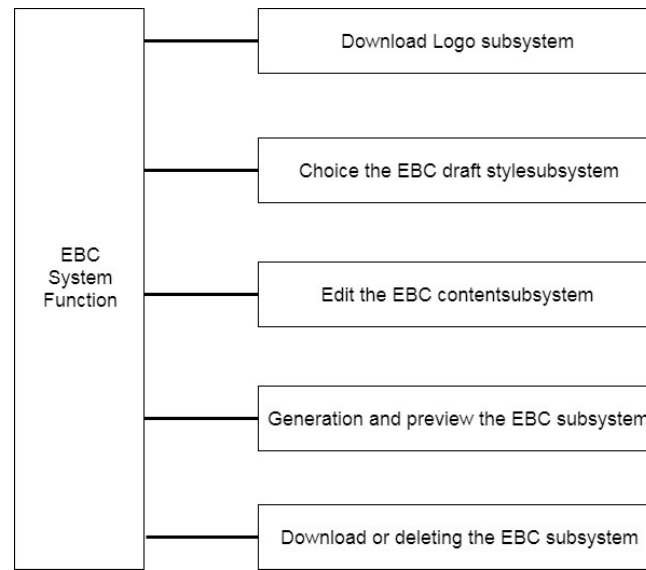


Fig. 5. The function architecture diagram of cloud EBC system.

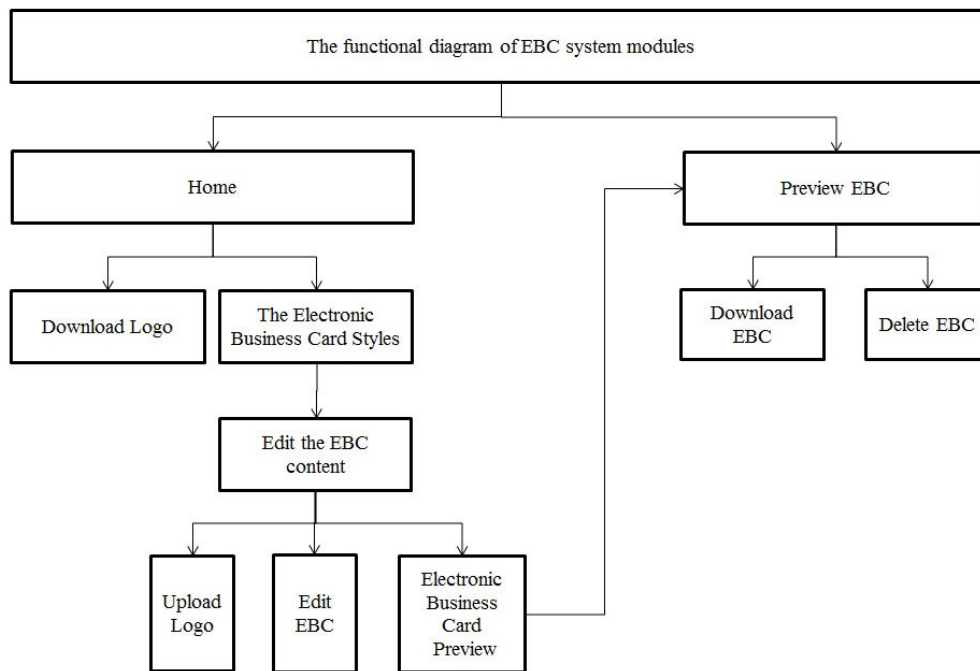


Fig. 6. The functional diagram of EBC system modules.

Table 6. The ROI list of cloud EBC system.

Employee number	EBC requirement quantity (card)	Price/card	Saving profit	Investment cost of cloud
100	100	£ 0.26	£ 26,000	£ 37.92
ROI = (Profit – Cost) / Cost = 685%				Year-based

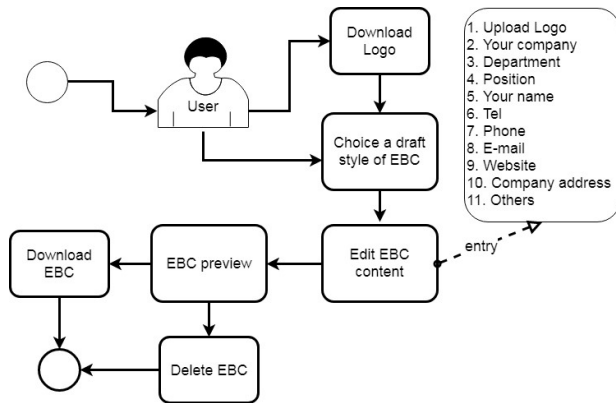


Fig. 7. The human-computer interface interactive diagram of cloud EBC system.

as Digital content model conversion system converts the HTML content page of Shareable Content Object Reference Model into the content documents of Electronic which is a conversion process needs the content presentation, meta-data, and package structure. The key point is a conversion system was introduced and implemented [9].

```

74 <!-- start! -->
75 <div id="div0"> <div id="div1">
76 <?php if ($product['thumb']) { ?>
77 <!-- <a href="<?php echo $product['href']; ?>" --> " title="<?php echo
78 $product['name']; ?>" class="img-thumbnail" /> <!-- </a -->
79 <?php } ?>
80 </div>
81 <?php if ($product['option']) { $mdiv=2; ?>
82 <?php foreach ($product['option'] as $option) { ?>
83 <?php if (substr($option['value'],-3) == "gif" or substr($option['value'],-3) == "jpg" or substr($option['value'],-3) == "png") { ?>
84 <div id="<?php echo "div".$mdiv; ?>" >  </div>
85 <?php }else{ ?>
86 <?php if ($mdiv == 3) { ?>
87 <div id="<?php echo "div".$mdiv; ?>" style="font-size: 45px; font-weight:bold;"><?php echo $option['value']; ?></div>
88 <?php }else{ ?>
89 <?php if ($mdiv == 11 or $mdiv == 12) { ?>
90 <div id="<?php echo "div".$mdiv; ?>" style="font-size: 20px; font-weight:bold;"><?php echo $option['value']; ?></div>
91 <?php }else{ ?>
92 <div id="<?php echo "div".$mdiv; ?>" style="font-size: 30px; font-weight:bold;"><?php echo $option['value']; ?></div>
93 <?php } ?>
94 <?php }
95
96 if ($mdiv == 6) {
97 $name = $option['value']; } if ($mdiv == 7) { $phone = $option['value']; } if ($mdiv == 8) { $phoneCell = $option['value']; }
98 if ($mdiv == 9) { $email = $option['value']; } if ($mdiv == 10) { $url = $option['value']; } if ($mdiv == 11) { $adress = $option['value']; }
99 if ($mdiv == 12) { $note = $option['value']; }
100
101 $mdiv = $mdiv + 1; } ?>
102 <?php } ?>
103 <?php
104 include('./qrcode/qrlib.php');
105 $tempDir = "qrcode/temp/";
106 // we building raw data
107 $codeContents = 'BEGIN:VCARD'. "\n";
108 $codeContents .= 'FN:'.$name. "\n";
109 $codeContents .= 'TEL;TYPE=work:'.$phone. "\n";
110 $codeContents .= 'TEL;TYPE=cell:'.$phoneCell. "\n";
111 $codeContents .= 'ADR;TYPE=work,FREF;:'.$adress. "\n";
112 $codeContents .= 'EMAIL:'.$email. "\n";
113 $codeContents .= 'URL:'.$url. "\n";
114 $codeContents .= 'NOTE:'.$note. "\n";
115 $codeContents .= 'END:VCARD';
116 // generating
117 QRcode::png($codeContents, $tempDir.'EBC.png', QR_ECLEVEL_L, 3);
118 // displaying
119 echo '<div id="div13"><img src="'.$tempDir.'EBC.png' /></div>'; ?>
120 </div>
121 <!-- End! -->
122 <!-- Here is a corresponding subprogram of 'HTML to Image' ; -->

```

Fig. 8. The 'cart.tpl' program codes of 'View' model


```

1 <style>
2 /* CSS */
3 #div0 {
4 position: relative; margin: 0px auto; width: 1111px; height: 680px; color:#000; }
5 #div1 { position: absolute; z-index: 1; }
6 #div2 { position: absolute; margin: 70px 70px; z-index: 2; }
7 #div3 { position: absolute; margin-top: 70px; margin-left: 220px; z-index: 3; }
8 #div4 { position: absolute; margin-top: 140px; margin-left: 220px; z-index: 4; }
9 #div5 { position: absolute; margin-top: 210px; margin-left: 220px; z-index: 5; }
10 #div6 { position: absolute; margin-top: 210px; margin-left: 660px; z-index: 6; }
11 #div7 { position: absolute; margin-top: 280px; margin-left: 220px; z-index: 7; }
12 #div8 { position: absolute; margin-top: 280px; margin-left: 660px; z-index: 8; }
13 #div9 { position: absolute; margin-top: 350px; margin-left: 220px; z-index: 9; }
14 #div10 { position: absolute; margin-top: 420px; margin-left: 220px; z-index: 10; }
15 #div11 { position: absolute; margin-top: 490px; margin-left: 220px; z-index: 11; }
16 #div12 { position: absolute; margin-top: 560px; margin-left: 220px; border-top-style: dotted;
17         border-bottom-style: dotted; z-index: 12; }
18 #div13 { position: absolute; margin-top: 466; margin-left: 938px; z-index: 13; }
19 </style>
20

```

Fig. 9. The CSS code of EBC

```

122 <!-- Here is a corresponding subprogram of 'HTML to Image' ; -->
123
124 <br/>
125 Electronic Business Card - Name : <?php echo $name; ?><br/><br/>
126 <input type="hidden" name="quantity[<?php echo $product['key']; ?>]" value="0" size="1" class="form-control" />
127 <button id="orderingtochange" type="submit" data-toggle="tooltip" title="<?php echo $button_remove; ?>" class="btn btn-danger"><i class="fa
fa-times-circle"></i> Delete</button>
128 <input id="NCU104481008" class="btn btn-primary" type="button" value="EBC download" />
129 <script src="./qrcode/html2canvas.js"></script>
130 <script type="text/javascript">
131 $("#NCU104481008").click(
132 function() {
133     html2canvas($("#div0")[0], {
134         onrendered : function(canvas) {
135             var url1 = canvas.toDataURL();
136
137             var thisDownload = $("<a>").attr("href", url1).attr("download", "<?php echo 'The EBC of ' . $phone; ?>").appendTo("body");
138             thisDownload[0].click();
139             thisDownload.remove();
140         }
141     });
142 }
143 </script>
144

```

Fig. 10. A corresponding subprogram code of 'HTML to Image'

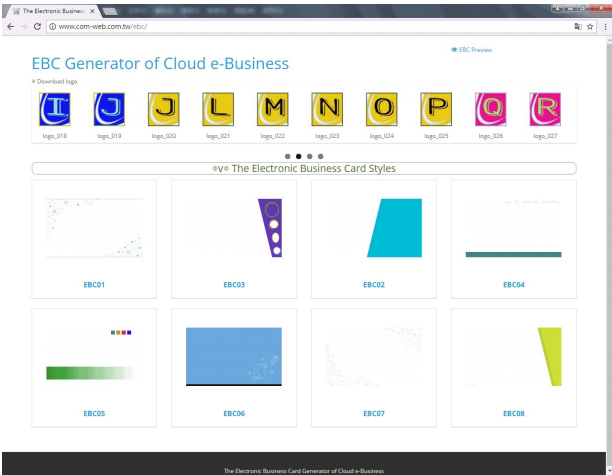


Fig. 11. The homepage interface of cloud EBC system

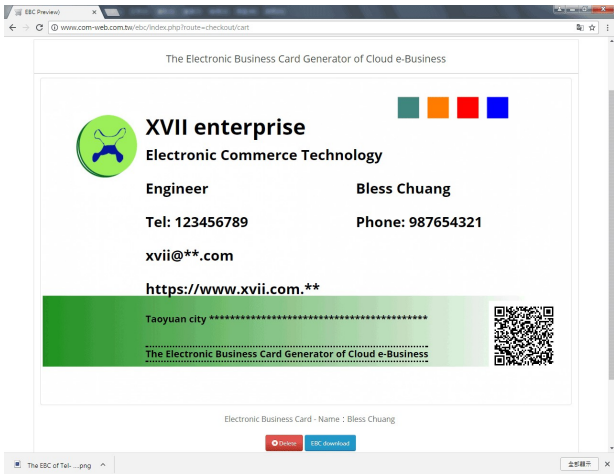


Fig. 13. The preview interface of EBC

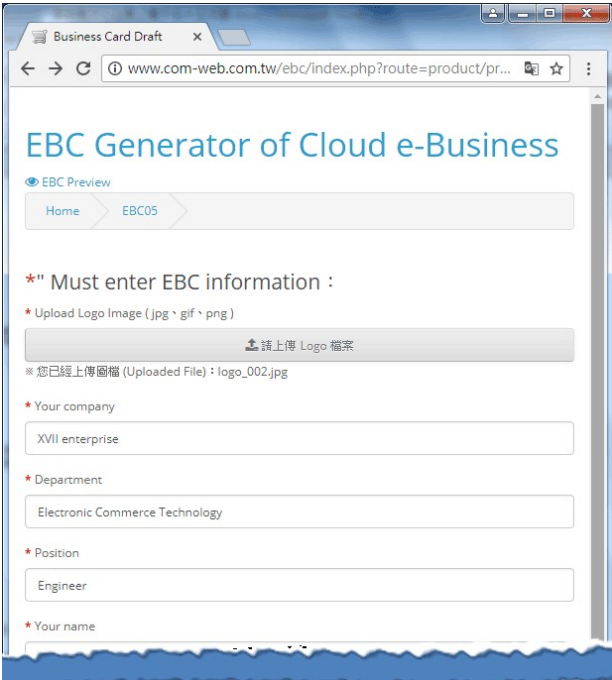


Fig. 12. The interface of enter data and upload image

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