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# Orchestrating New Markets Using Cloud Services

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**Abstract.** This paper examines the needs of SMEs for services that enable the key business functions required. Through a series of semi-structured interviews with 30+ SMEs, it is concluded that the services required varied in importance depending on the size and stage of development of the SME. As a result, the key IT requirements for operations in SMEs were developed and a suggested list of cloud-based applications to deliver them through a city cloud service was derived. A good initial point for these Cloud services is to provide a set of common services for SMEs to utilise that enhance collaboration capability. This paper presents the architecture of a set of cloud services that can, via a City Cloud, enhance and boost economic activity in the City Cloud region. Significant elements of the architecture have been tested and key results are presented.

**Keywords:** SMEs, Business Processes, Cloud Services, City Clouds, Business Clouds, New Markets

## 1 Introduction

Within the field of Information Technology (IT), every so often a new approach appears which promises to change the way businesses operate and function. Cloud Technology is possibly such an approach. This wide ranging paper brings together a number of ideas to propose a novel model for orchestrating new markets and driving economic growth in a region

Cloud computing has been defined as “a model for on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.” [1]. Over six hundred articles that discuss cloud services and their applicability have cited this definition. Using a terminology more suitable to small businesses, this research understands Cloud Computing as a new general-purpose Internet-based technology through which information storage and IT services (applications, network and bandwidth) are provided to customers in a “pay as you go” model. Cloud Computing can allow SMEs to focus on their core business rather than worrying about applications, server updates, computing issues and IT maintenance. This paper is split into two main areas of investigation:

1. How does the use of different business applications vary with the size of the SME (section 2);

2. In a Smart city cloud, what other applications would be required to enhance economic growth (section 3&4).

A number of projects such as the EU Platform for Intelligent Cities (EPIC) or the joint EU and Japan “Cloud of Things for empowering the citizen cloud in smart cities” (ClouT) have been undertaken. Yet rarely is there a focus on using The Cloud to enable and enhance the SME economic activity in a City region. A few cities such as Honolulu (USA), Edmonton (Canada), Geraldton (Australia) have implemented city cloud services but have not focused on enabling SMEs. Dongying in China is building a City cloud computing platform as a government/business model. However, the business aspect is largely focused on the Oil industry supply chain. This lack of focus on SMEs seems to be a major oversight to the authors. It is SME skills/capability and the business activity they enable in a region that services larger businesses and thus helps fund other services such as transportation, energy and health. There are many cloud service providers advertising their cloud applications to SMEs to help them run their business processes. Various approaches are described in the published literature [2] to guide SMEs on either the preparation to migrate to a cloud platform or the implantation of cloud services in their business. These services, however, do not emphasise the benefits from increased collaboration that would arise if all the SMEs in a region used similar business applications.

In the new and fast growing area of Smart Cities and their application of cloud technology, a discussion theme on how cloud services could be used as a utility to support a wide range of SMEs and drive collaboration and economic growth is necessary. More crucially, such services could enable and extend the business collaborations on which SMEs increasingly depend [3]. The ability by SMEs to lower cost but easily access additional capability and address new opportunities via the cloud would be a key driver of economic growth. SMEs aggregating capability through collaboration can open new markets and better satisfy local ones. This issue is discussed and a cloud model is suggested for a cluster of regional SMEs.

## 2 SME Functionality Requirements

Primary and secondary research was conducted to identify the ICT application requirements of micro, small and medium SMEs.

If the value-adding activities of an SME are identified, suitable cloud applications can be matched to the value activity. Adoption of IT services in the value chain by SMEs has been discussed by several researchers such as [4-6]. Research done by [7] summarizes the ICT usage by SMEs in fulfilling their business value activities. Their results are shown in Figure 1. Bharati *et al.*, [5] emphasises more on the firm size as a factor in adoption of ICT tools by SMEs in their value adding activities. Many researchers [8, 9] have discussed that technology adoption varies according to firm sizes. They discuss that the smaller the firm, the less likely for it to adopt complex ICT tools such as ERP, SCM and CRM. However, there are a few researchers who oppose it. Several authors have stressed that firm size is not a reason for varied technological adoption between firms [10-12]. To validate whether firm size does or does not matter in technological adoption between firms, the authors conducted semi-structured interviews with a sample of SMEs in the West Midlands region of the UK. The interview results

are summarised in Table 1 which identifies the business capability required and the extent of usage by company size. The results align with the literature discussed earlier except for CRM. It was also confirmed that the more complex the ICT tools the less likely they are to be adopted by micro SMEs. It may be concluded that all SMEs need similar IT tools but the degree of application of the IT tools depends on the firm’s size.

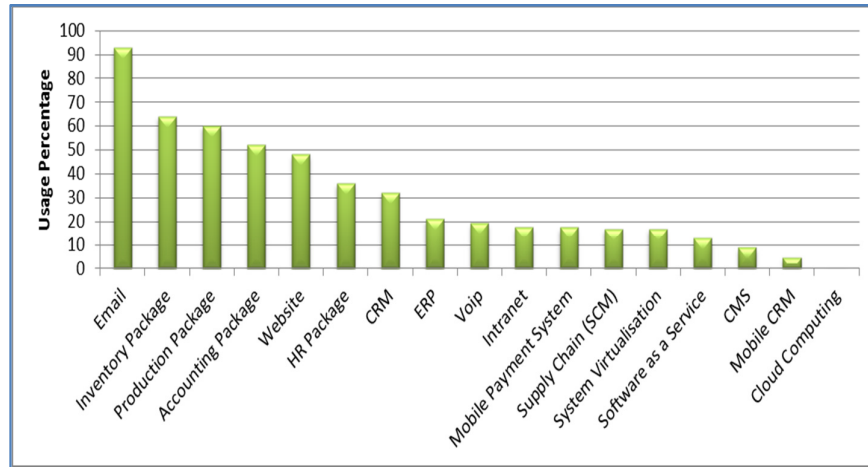


Fig. 1. ICT usage in SMEs (sample size 300)

Table 1. Business Process corresponding to the value activity based on SMEs size

Business Process	Value Activity	Usage in Percentage
Accounting and finance	Firm Infrastructure	Medium (100%) Small (92%) Micro (69%)
Website, e-Commerce, CRM	Marketing and Sales	Medium (78%) Small (64%) Micro (70%)
Production Planning, Inventory Management, Knowledge management, ERP	Operations	Medium (67%) Small (40%) Micro (31%)
IT Asset Management, Application Development	Technology Development	Medium (67%) Small (50%) Micro (44%)
Human Resources	Human Resource Management	Medium (67%) Small (25%) Micro (11%)
Supply Chain Management	Inbound & Outbound Logistics	Medium (33%) Small (42%) Micro (22%)
Electronic Procurement	Procurement	Medium (67%) Small (20%) Micro (11%)
Communication, File Sharing, Email, Data Storage & Backup, Database	Others	Medium (92%) Small (74%) Micro (74%)

### 3 Collaborate to Compete

Seth Godin [13] shared this insight: “The dramatic leverage of the net more than overcomes the downs of the current economy. The essence is this: connect. Connect the disconnected to each other and you create value.” The issues for connection for a cloud architecture were summarized into four categories by [14] and are listed below:

- Interoperability of data between different applications should be allowed inside a single cloud environment
- Exchange of data between applications across different cloud providers
- Software programs should be able to connect and integrate data between multiple cloud environments
- Migration of cloud application and data from one cloud provider to another.

This proposed model is taken to next level where Internet Service Providing (ISPs) SMEs, which develop IT solutions, and SMEs that need IT solutions are brought together onto a single cloud platform. This provides a market for both ISPs and application consumers to operate their business on a single platform. The principle of developing applications by SMEs for SMEs that use this platform are supported by [15, 16]. This requirement justifies why “Google Apps for Business” applications were recommended for SMEs. Google “Apps for Business” links Application users with application providers in a common framework as required by the Open Cloud Manifesto. Such architecture makes collaboration between SMEs technically easier, but by itself does not provide business drivers to increase collaboration between SMEs. To overcome the incompatibility issues shown in Figure 2a and to provide the business drivers to increase SME collaboration, the authors propose a framework where the IaaS and PaaS are standardized by using a single IaaS and PaaS provider. The suggested architecture will be hosted by a city or a regional cloud and supported by a network of IT and human services to drive business activity through enabling collaboration.

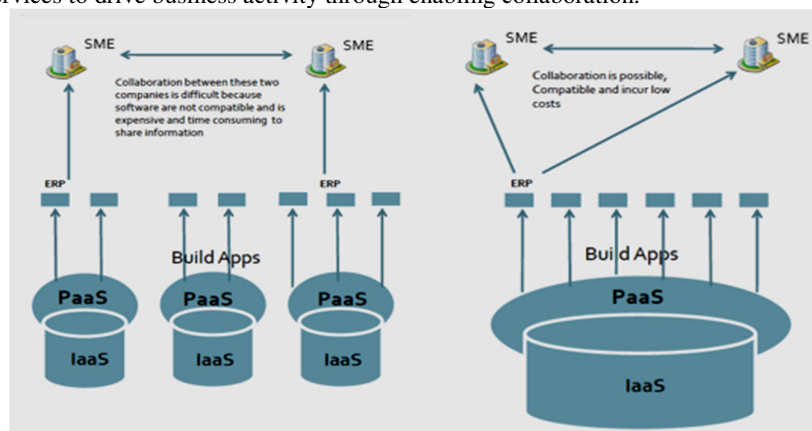


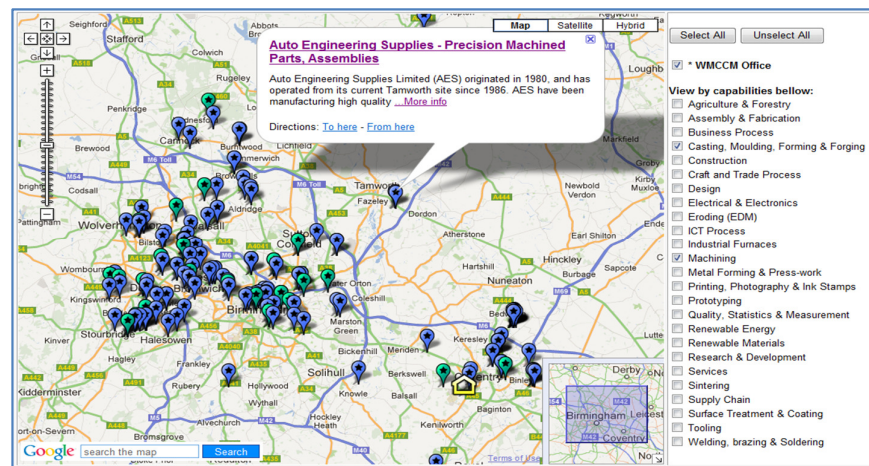
Fig. 2a

Fig. 2. Open City Cloud Model

Fig. 2b

One key conceptual and business change required to make this happen is to describe business in a different way. Typically businesses describe themselves by the products they make and thus the sectors they are active in. For the last ten years the authors have been testing the benefit of SMEs describing their competence and capability instead, and having that validated by an independent body. Figure 3 shows an example company description that lists among other things, the processes, machinery and skills a SME has. A full list for many companies can be seen by searching the directory at [www.wmccm.co.uk](http://www.wmccm.co.uk). Fig 4 show a view of a group of such rated companies in a City region based on their core competencies. The resulting business benefits and thus drivers for collaboration from providing such descriptions for a group of companies are (based on experience with our regional portal):

1. City Capability visible to the World increases business opportunity for individual SMEs – in our experience 3-5 times more business enquiries.
2. Common set of Business Apps eases/increases local collaboration
3. Business Operating Costs Lowered – switch capital costs to revenue costs
4. Entrepreneurship Success Rate increases – Out of 97 start-up business assisted there was an 84% survival rate four+ years later.



**Fig. 3.** Competency Map for Casting, Moulding, Forming and Forging capability in WMCCM

#### 4 Orchestrating New Markets

The architecture described above achieves benefits by lowering the cost of access and enabling and driving collaboration through improved visibility and access to higher value business opportunities.

The authors have developed and run a portal ([www.wmccm.co.uk](http://www.wmccm.co.uk)) for SMEs in the West Midlands region of the UK to help test some of the concepts discussed. The Portal provides services to help business attract more business opportunities, and to partner in order to address these opportunities. The key enablers to this are:

1. Providing a trusted description of what these SMEs CAN do. This does not mean listing their current product and services, but listing the key processes and machinery they have and their level of expertise in utilising them. Most other SME business portals list the products.
2. Providing a feed of higher value tender opportunities.
3. Providing a partnership formation function to quickly form partnerships to address the high value tender opportunities based on capability and cultural fit.
4. Provide secure online collaboration spaces for partnerships formed.

The current system has a SME membership of about 12000 and these SMEs win business of the value of the order of 6Bn Euros each year. The success rate of new ventures supported through the Portal is significantly higher, for example 84% of new ventures still operating four plus years after their formation.

The authors can also identify a number of additional services to support the City Business Cloud model. These include business benchmarking and improvement services to drive SMEs performance improvement, access to tender and tender bid support services, and access to a local Experts register. The full architecture of common business services to be provided by a City business cloud based on the authors experience would be as shown in Figure 4.

With the addition of the proposed architecture to the open cloud for SMEs discussed previously, the authors can see a business environment where:

1. The City's budget can be spent with local SMEs, because local businesses can now collaborate to provide scale/capacity and full capability. Normally these types of tenders would go to national businesses, many of whom are not locally based.
2. Benchmarking reports would allow SMEs to assess their processes against best practice and drive performance improvement.
3. External access to the capability of the city's SMEs would draw in extra business opportunities (our experience with the WMCCM portal suggest 3-5 times more).
4. Substantial opportunities for import substitution would arise, through the orchestration of capability to address opportunities in the region and in other regions.
5. Local expertise would be captured through a experts register, that would include retired people and would act like a City Knowledge base.
6. SMEs move into new markets based on their capabilities. An example is a local car seat making business that is now a major supplier of body piercing jewellery. The common capability is the ability to bend and join wire precisely.
7. Collaboration with other City clouds in regions with complementary markets is eased. For example WMCCM companies are in a region with major automotive industry support capability, other parts of the World have major automotive assembly industries but little support industry e.g. Port Elizabeth in South Africa.
8. We expect emergent behaviours and business models arising from the environment created, which are largely unanticipated. For example a "broker" class of intermediary may well arise that orchestrate capability using the city business cloud to address new business opportunities. (Our experience from WMCCM).

This represents the current state-of-the-art in SME enablement through a city cloud in the authors opinion, based on their ten years of experience with the WMCCM system,

discussions with a number of cities looking to implement city clouds and recent experience of working with Inner Mongolia University and the Singapore A\*STAR research organization where efforts to map and monitor business capability are underway.



Fig. 4. Architecture for a Smart City Business Cloud

## 5 Conclusion

This paper builds on and integrates a number of concepts derived from literature and practical experimentation. The benefits of collaboration to SMEs in order to increase their higher value capability and capacity, is key focus. Barriers to collaboration can be many but a key one is often incompatible systems. This is a major problem as they often do not have the IT skills or financial resources to address this. This paper identifies the core functionality needed by SMEs as they grow and suggests a set of cloud application



that are best suited to help them grow through collaboration. A group of SMEs using common systems within a cloud business support architecture, as suggested in Figure 4, can power economic growth in a City cloud. This has been partially tested by a regional portal, the West Midlands Collaborative Commerce Marketplace ([www.wmccm.co.uk](http://www.wmccm.co.uk)), where 12000+ SMEs win business worth more 6Bn Euro. A key feature of such a service is a focus on capability not on products, as is normally the case. Through combining capability, SMEs in a City cloud, can address new higher level opportunities, and create new local capability. As an example WMCCM generated a capability to build toilet modules for railway carriages when none existed in the region previously. Further research with WMCCM, Singapore and in Inner Mongolia is being undertaken to validate the full model.

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