A strategic approach to exploiting and implementing BIM, Big Data Analytics, and Internet of Things (BBI) for competitive advantage in the construction industry
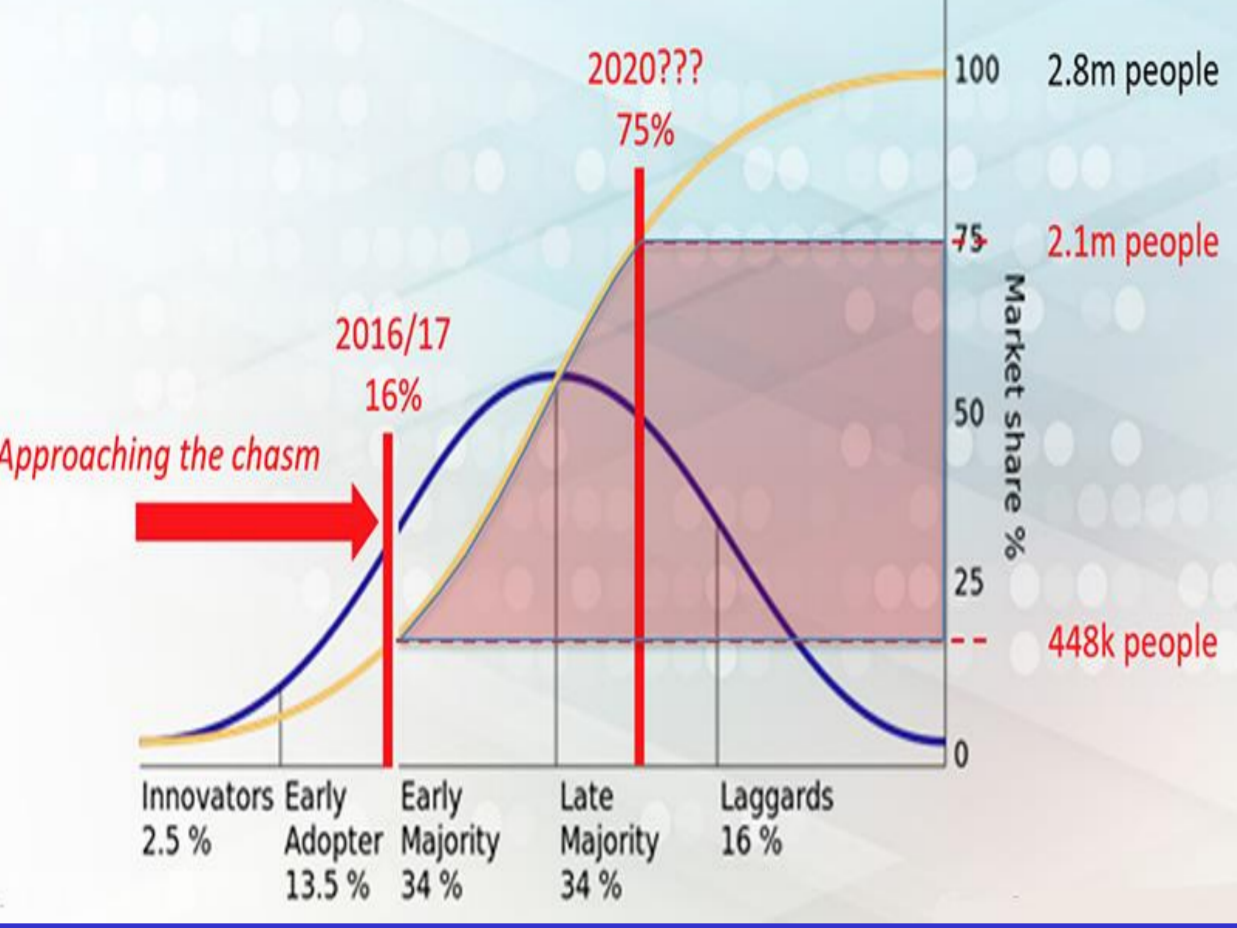
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Introduction

BIM is a collaborative platform (consisting of set of technologies, processes and policies) that integrates all stakeholders in designing, constructing and operating a facility. Internet of Things (IoT) makes devices (smart phones, remote controllers, sensors, actuators) capable of interconnecting and communicating with each other over the Internet. With the increase in population and billions of devices used in businesses that communicate with each other, this results in enormous amount of Big Data. Big Data Analytics (BDA) is required to store and manage these big data to form a sort of understandable information and knowledge. Data generated from BIM can be analysed and managed by BDA and diffused to relevant parties through IoT. This is the concept of BBI which can be used by organisations as strategic tools for competitive advantage.
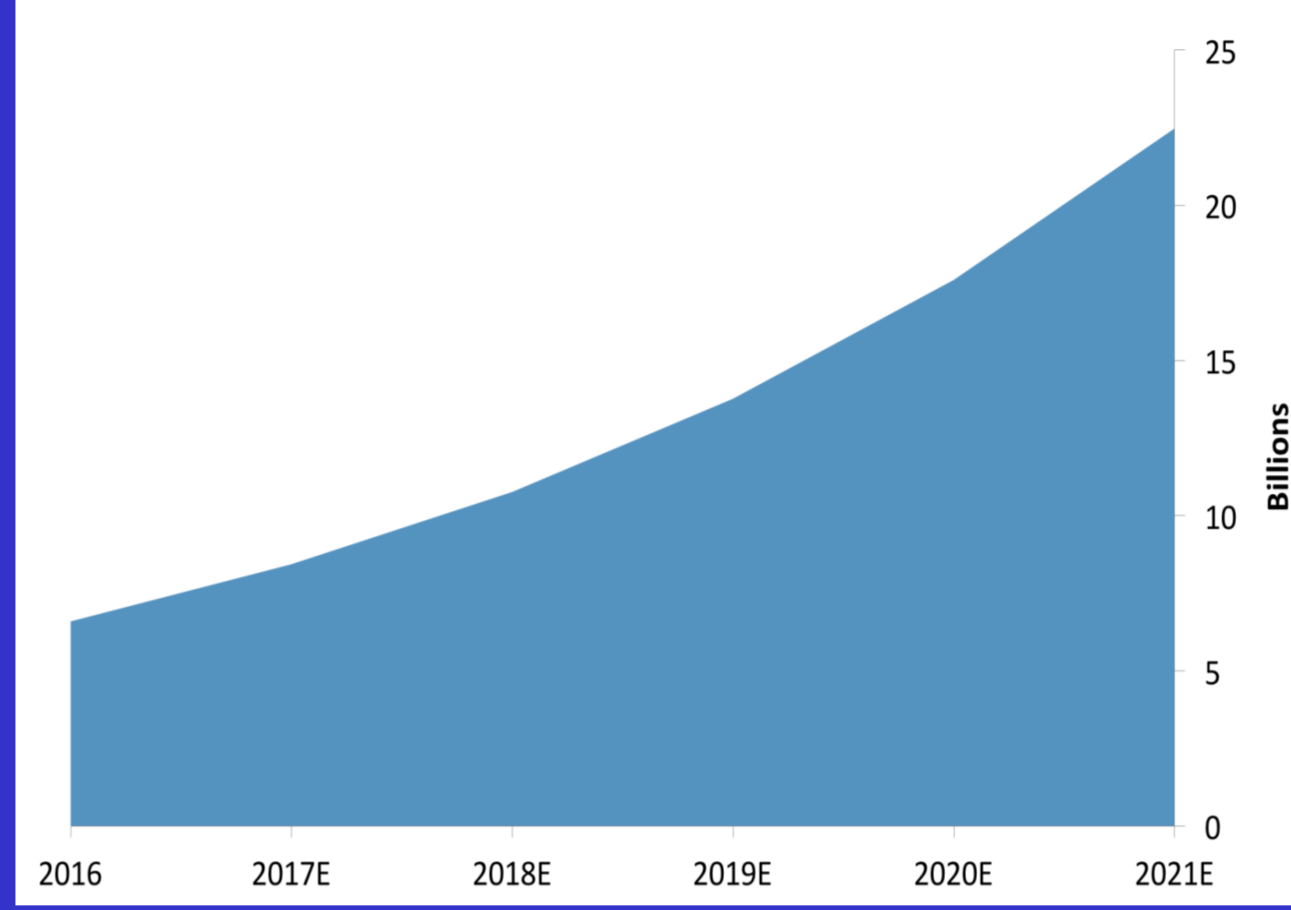

IoT Implementation

Big Data Implementation — 80% ENTERPRISE ORGANIZATIONS VS 63% SMB — HAVE DEPLOYED OR PLAN TO DEPLOY BIG DATA PROJECTS
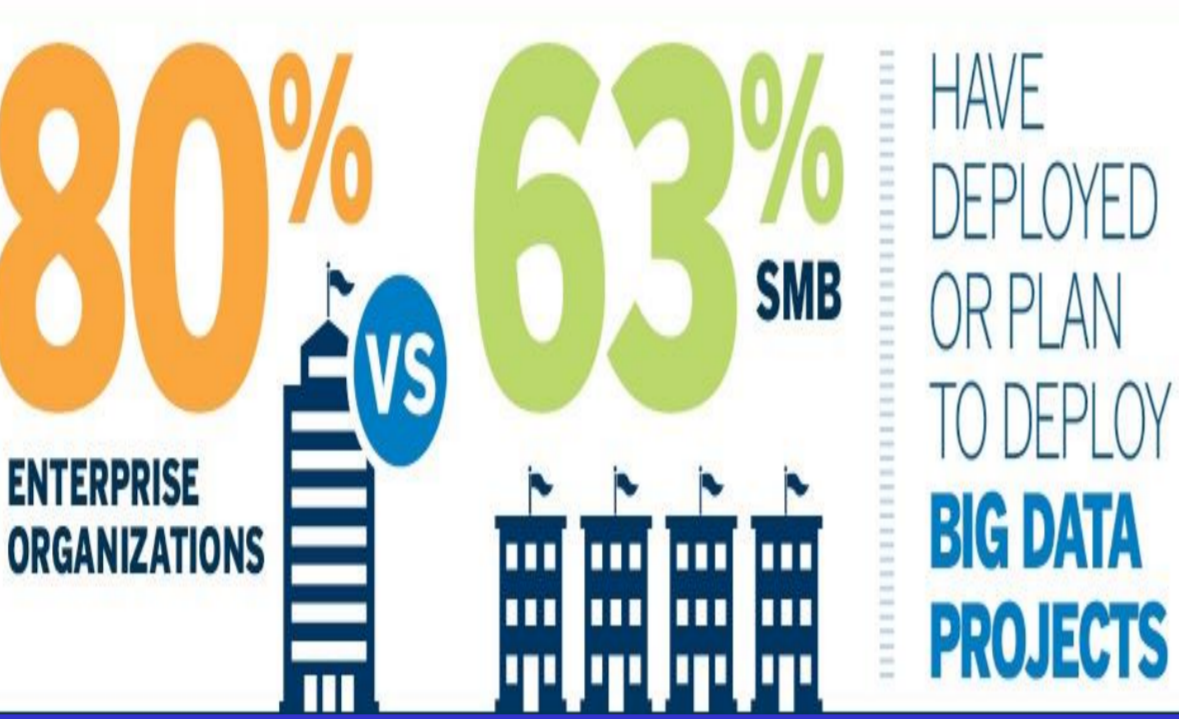
FORECAST: IoT Device Installation Base — Global, 2016-2021

Background and Motivation- BBI

- An increasing trend and demand for BIM, BDA and IoT (BBI) in construction
- Adoption of Big Data Analytics and IoT in to constructions is still at nascent stage
- Skills and training needs, implementation issues are identified as the major barriers for the imp mentation of BBI while government has made few mandates for 'digital-built-Britain' in 2020

Research Problems- Construction industry Related

- Not fully utilizing digital technology
- Difficulty to share and reuse the information;
- Information produced is not re-usable;
- Large amount of data is unnecessarily duplicated
- The fragmented nature of industry
- Project based, inhomogeneous culture
- Corporate memory lost
- Productivity problems;
- Shortage of skilled professionals
- Speed of innovation is comparatively low
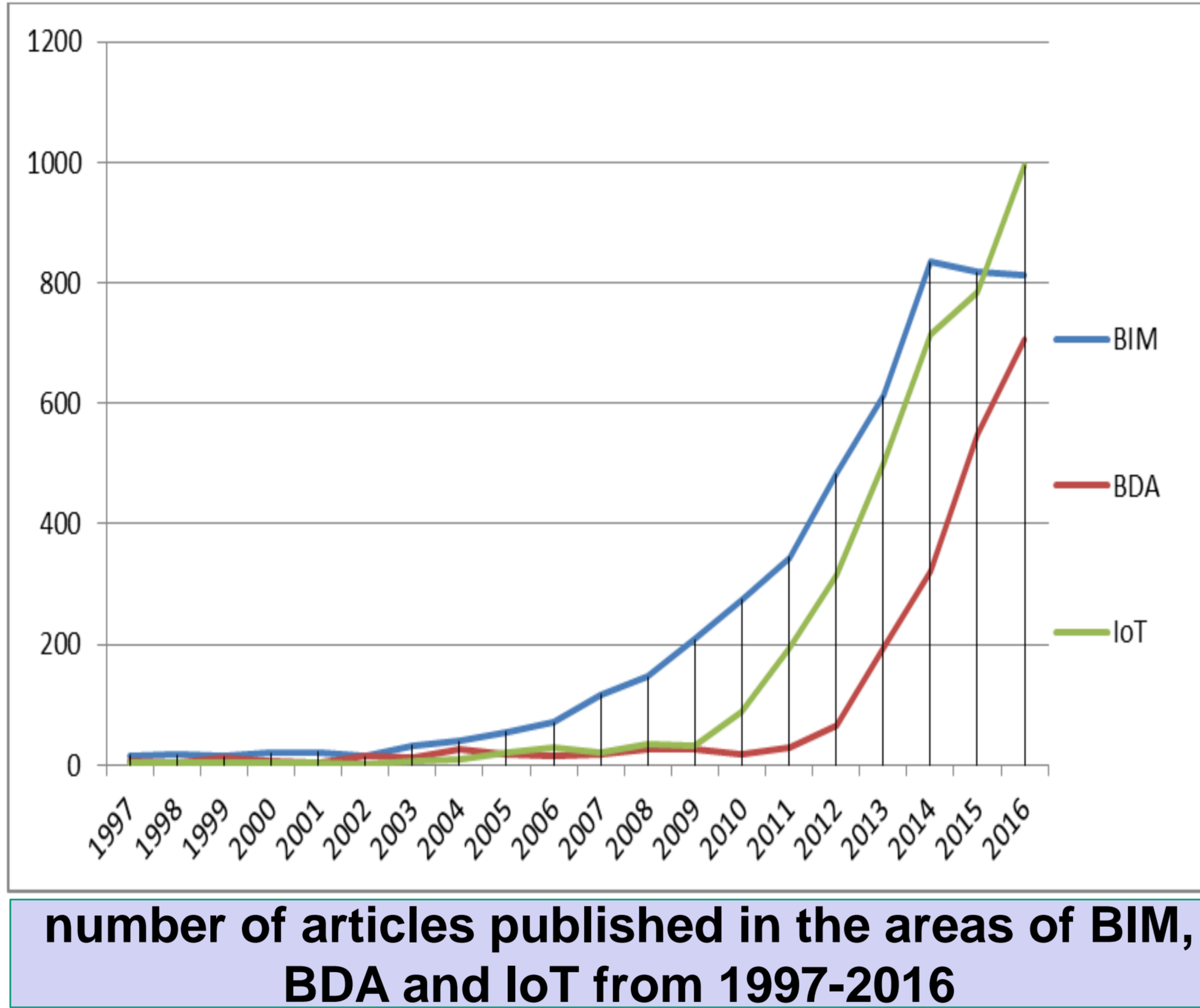
number of articles published in the areas of BIM, BDA and IoT from 1997-2016

Methods

Mixed methodological approach inter-alia systematic literature review, secondary data based case studies, interviews and questionnaires

BIM-IoT — Designing buildings that mainstream the internet of things in to their operations

BIM Collaboration

BIM- Smart Data — Leveraging the value of data from models and uses via innovative services

Research Aim

To develop a framework for improved understanding and exploitation of BIM, Big Data Analytics, and Internet of Things as strategic tools for competitive advantage in construction.

Findings up-to-date

Building Information Modelling (BIM)	Big Data Analytics (BDA)	Internet of Things (IoT)
Preferences and Insights		
80% of the clients prefer visualising the end project ahead of construction	57% want consistent, up-to-date financial and project information.	83% of the construction organisations in UK see the adoption of IoT as a competitive advantage
Reduce rework is necessity to minimise budget and time overruns	48% want to be warned when situations occur.	Organisations competing on IoT outperform their peers substantially 220% (1.6x in profit, 2.5x in stock price appreciation and 2.0x in productivity growth)
BIM contributes overall sustainability	41% want forecasting, allowing them to better prepare for best and worst-case building events.	
Efficiencies through design-construction and facility management	14% want online analytics to see factors affecting profitability	
Business case for Competitive Advantage		
Stimulate ,visualise and reality captured	Company performance evaluation	Remote operation and Supply replenishment
Waste minimisation	Better targeted marketing	Construction tools and equipment tracking
Detailed presentation	Improved decision-making	Equipment servicing and repair
Fully collaboration	Problem prevention	Remote usage monitoring
Maintain control and conflicts minimsied	Tracking construction equipment and assets	Power and fuel savings
Conflicts are utterly resolved through greater control	Reduction of construction project risk	Augmented Reality (AR)
Change orders and variations minimised	Simulation before construction & Construct offsite	BIM collaboration & personalised home experience
	Construction site organization	Energy and usage analytics and Smart Facilities

Discussion summary- Strategy

Factors impact for overall BBI implementation
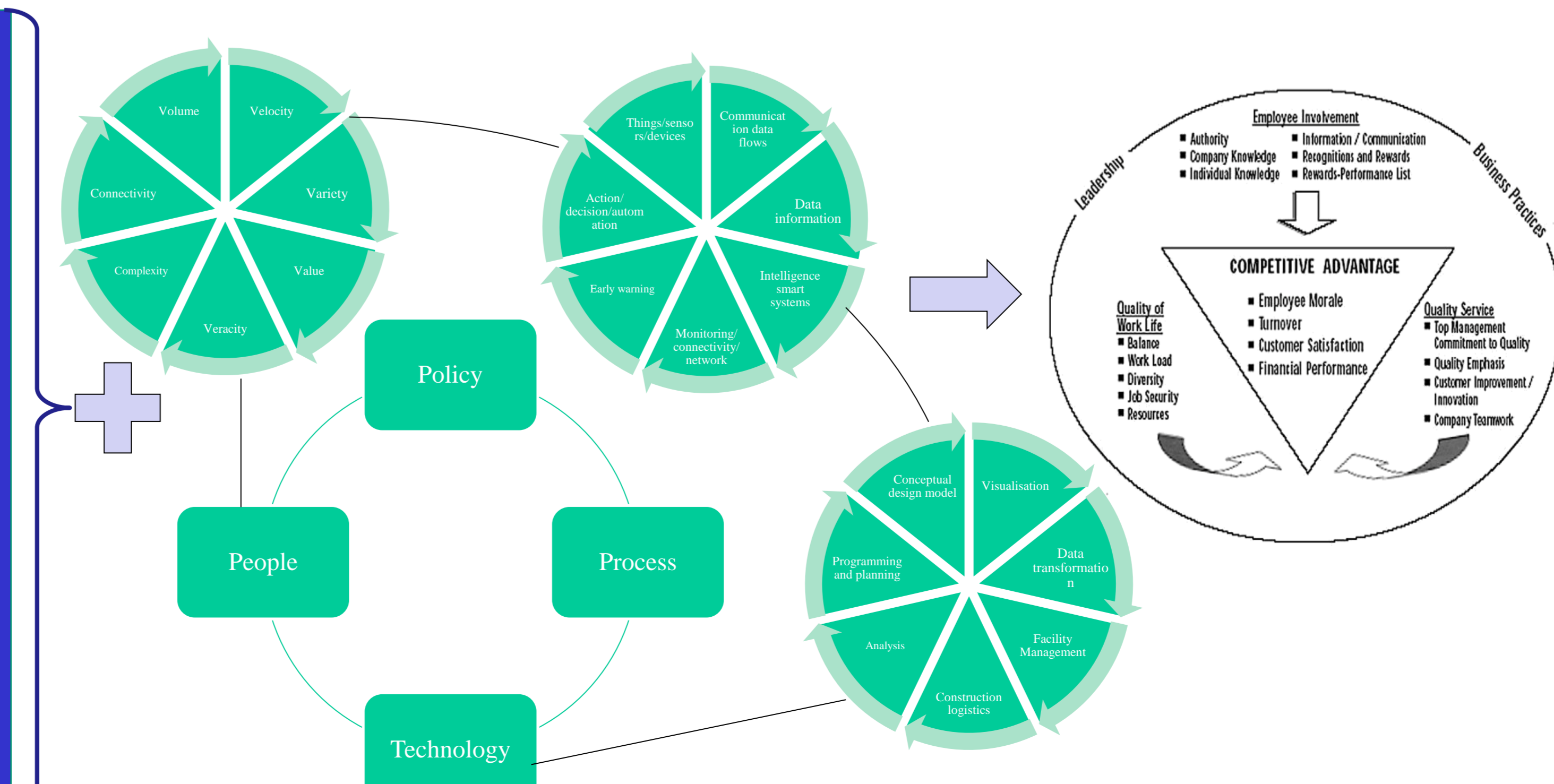
Literature Cited

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