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Multi Business Model Innovations in a World of 5G – Towards a World of Advanced Persuasive Business Models Embedded with Sensor- and Persuasive Technologies

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14.1 Introduction

Why focus on persuasive business models (PBM) related to sensor- and persuasive technologies in a future world of 5G?

The answer could be

"Technology will always be in need of a Business Model"

Or

"No technology" – neither persuasive technology in a world of 5G – "will go or do without a Business Model" – or in fact many Business Models" (Inspired by Chesbrough) [2, 3]

Further what can the world of 5G provide related to ethics, trust and security of these PBM's.

It appears that researchers and practitioners have yet not researched widely on PBM's related to 5G and how they can and will be applied in the benefit of business, society – and humans. What can businesses and society gain of PBM but what can they probably also loose from the invasion of PBM.

The chapter discusses different aspects and expected evolvement of PBM innovation in a world of 5G in reference of a definition and proposed framework of a PBM.

PBM embedded with sensors and persuasive technology could potentially lead businesses and society into a new area of growth in 2030's 5G world – if 5G technologies and support ethics, trust and security.

Research carried out by Boston Consulting Group back in 2009 showed that "Business Model Innovators earned in an average premium that was four times greater than that enjoyed by product or process Innovators" [12]. Which results can we expect from PBM in a world of 5G?

Businesses focusing on Business model innovation (BMI) have until recently delivered returns that are larger and more sustainable than product and process innovation" [12]. However this is predictably not going to stay on as more and more businesses realize the importance of BMI and gain the competence to do BMI. Further as BM's face the same high speed trends as products did in the early 2000's – the lifetime of BM's shrinks and must even shrink dramatically more every day.

As this race of development and innovation of technologies in the "slip stream" of 5G is going on.

"How will the business models and business model innovation in a world of 5G expectable look like and be influenced by 5G?"

"What will expectable are the next era of BMI related to the evolving 5G technologies developed?"

Well our research in the MBIT group certainly points firstly to the era of multi business models. Secondly to the raise of PBM's embedded with persuasive technologies.

14.2 Persuasive Business Models and Business Model Language

"Technology will always be in need of a Business Model" [2] but Business models will however also in a world of 5G – maybe even more than in the past – be in need, based on and dependent on advanced technologies.

BMI these days is influenced by the growing numbers of sensors embedded in everything, everybody and anywhere. Just in 2020, 300 billion sensors are expected spread out in our society – making our lifestyle and thereby BMI different. The intelligent sensors and not least printed, flexible and biological sensors are expected to change the game of BMI. Sensor technology will e.g., mean inspired by Bryzek [1] and Drupa [4]:

- **'unobservable' sensing BM** which will break new ground in the technology **component** of the BM e.g., the dimension of sensing biohazards, smells, material stresses, pathogens, level of corrosion and chemicals in BM's.
- **Micro-sensor implants** in humans, animals and environments – which will track e.g., the healing process for internal injuries, illness, enable

health and animal care professionals and machines to take remedial action based on continual data – big and mega data – from the BM eco system.

- **Biodegradable sensors** monitoring e.g., soil moisture or nutrient content for optimum crop production or healthcare for human's suffering from diabetes.
- **Self-powered sensors** powered by using the heat difference between the human's, animal's or machines "body" and surrounding air.
- **Self-healing sensors** repairing themselves in the event of disaster or other structural disruptions.
- **Live cell-based sensing** e.g., an amalgamation of sensor technology and living cells, allow scientist and business people to understand the biological effect of medicines, drugs, environment and biohazards.
- **Sensor swarms** coordinate their activities, deciding interactively what to measure and where through a self-learning system directing their movements, data collection and persuasiveness.
- **Smart dust**, microscopic sensors powered by vibrations, monitor situations ranging from battlefield activities, structural strength of buildings, clogged arteries or BM ecosystems.

The sensor technology in 2030 will expectable be even more advanced than today – as expected covering all 5 sensors – and enabling all 5 sensor technologies to speak together and be intelligent integrated [5–7, 11].

We thereby step into the intersection of different sensors, industries, disciplines, business models, cultures and backgrounds – in other words, embrace diversity in technologies and business models – of thought, perspectives, experience, expertise – and values – which will drive BMI into a new era.

Inspired by the Medici family in Florence, whose patronage of artists, architects, scientists, philosophers – the interdisciplinary approach – which in the Renaissance helped bring about a new age of creativity, discovery and innovation in Europe – is now turning back – The concept of the Medici Effect [9].

An increasing development of persuasive technology enabled by the evolvement of sensor technology, big data and 5G changes the game of BMI. The evolution and era of persuasive business models will result in more advanced PT's expected to come, evolve with tremendous speed and having such impact on business, society and humans never seen and imagined before.

PT [15 A] is still a vibrant interdisciplinary research field, focusing on the design, development and evaluation of interactive technologies – changing users' – human and machines – attitudes or behaviors through persuasion

and social influence. PB has still to be accepted and be researched deeply. Persuasive technologies can with the aid of 5G be used to change peoples and machines behavior in various domains. Persuasive technologies will be a vital component in the competence dimension of any persuasive business model in the future [16]. Expectably product-, service-, production- and process technology will be embedded with persuasive technologies in future business models – and thereby become PB BM's:

"the persuasive business model are strategically designed with the aim to change users, customers, networkpartners and employees behavior via its value proposition(s) acting interactively together with the other 6 BM dimensions and related BM's" [16].

The application of the persuasive BMs will expectably really take off with "the 5G roll-out" in the next 5 to 10 years [15]. The development of sensors and persuasive technologies makes it possible to create business model ecosystems with persuasive business models. Although persuasive business model use persuasive technologies and are basically created to "persuade" for a certain behavior in accordance with the strategy of the BM and business numerous examples shows that they have not just advantaged but also a backside. They should therefore be ethically being constructed secure – but today however they are mostly uncontrolled, unregistered and free of use.

We claim – there are some steps to be taken before we – the businesses and society reach a deeper understanding of how persuasive businesses really can use persuasive business models and what they really can do with persuasive business models.

On behalf of inputs from SW2010 [18]–SW2015 [19], lab experiments in the MBIT and Stanford Peace Innovation Lab together with state of the art persuasive business model and technology research we conceptual elaborate on a futuristic outlook to persuasive business models. What can we expect of persuasive business Models and persuasive business model innovation in a future world of 5G.

14.3 A World of 5G and Persuasive Business Models

"In the past ten years the number of sensor-, wireless and persuasive technologies in our everyday life, have increased many-fold. We are now moving fast towards a world of 5G which obviously will by standard have embedded persuasive technologies [4, 5, 15, 17] – and therefore it will soon be a reality to business to deal with these persuasive technologies. "The study of these

persuasive technologies, and how they affect our lives and routines are still very young – and we know little about how they will affect our future lives – but we know that what we can expect of persuasive technologies cannot even we imagine today [6, 15, 17].

Researchers, business and public players alike are keenly devoting themselves to understanding how these different persuasive technologies might be designed, so that desirable technologies, behaviour and not least "business models" are obtained and can be created, captured, delivered, received and consumed – hopefully secure and sustainable. There is large expectation to that 5G and persuasive business models both will enable better business. Especially healthcare and well care sector expects much of persuasive technologies [13] to overcome some of their big economic burden due to amongst others a growing elderly population and increasing medicine costs.

The power and importance of persuasive technologies embedded in a multitude of business models is therefore obvious! – and to some extent would some say – on the dark site scary – if not secured and lead in a valuable and sustainable directions. However the evolvement of persuasive technologies and persuasive business models are not to be stopped and their impact will be enormous in the future and even be clearer – as we move into a world of 5G.

14.4 Persuasive Business Models and Business Model Language in a World of 5G

Today most businesses are not really able to carry out and innovate persuasive business models. As the sensor-, persuasive- and 5G technologies develop there is suddenly no excuse and barriers technologically to not innovate persuasive business models. The challenges lay a whole different area. There is not yet an alignment and an accepted business model language in the business model community [20–23] are one of the major reason to this "barrier" – preventing business to take the next step into persuasive business modeling. A common agreed business model language is highly needed to make it possible for business to communicate their Business Model dimensions and components with one another – but more important using the full potential of persuasive and sensing business models [13, 14]. Many businesses are still what could be classified as "Business Model analphabetic".

In a world of 5G this language will be even more important to develop and have clarified. If all businesses could agree upon a common business

model language then persuasive business modeling and the use of persuasive business models could really take off – and not just be reserved for the use of large businesses with powerful computers and high skilled employees.

Today most businesses are just able to see a 2D mapping of their BM value exchange as we illustrate from one of our research projects in Figure 14.1.

5G will enable them with technologically to see data and get information of much more of the BM and its value stream. The abilities to really "see" the complex world of Business Models and the impact of Business Model Innovation.

Due to all the interactions that 5G technology will give us combined with advanced visualization technology business will be able to "see" and sense much more – and faster. It will provide them with enormous amount of new data, knowledge and insights, which they can be able to understand when they agreed on "a common language" and where to look [10].

"Unwrapping" BM knowledge in small lab experiments with a small part of a business – in this example just with few different BM's the picture shows us a rather complex and less operational picture of the value exchange between business models. This is shown in Figure 14.2.

Understanding this complex Business Model value creation, capturing, delivering, receiving and consumption process, of both tangible (full line) and intangible (dotted line) value exchanges between Business Models will however be essential and form the platform for persuasive business modeling in a world of 5G.

Our hypothesis is that PBM's will be in common in near future but before that we will see several generations of PBM. We expect that the real application

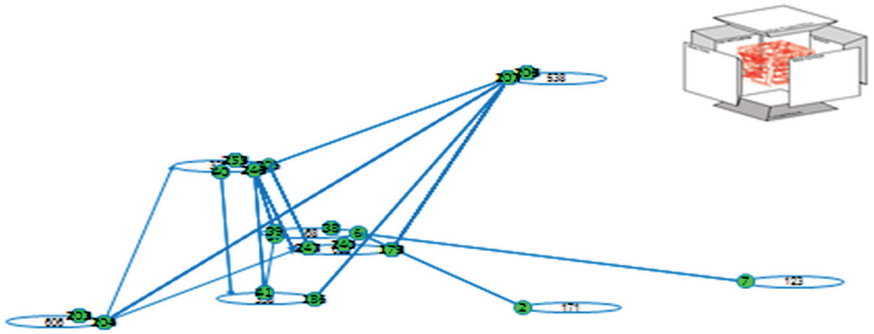

Figure 14.1 2D Mapping of one BM value exchange sequence from an industrial business [16].

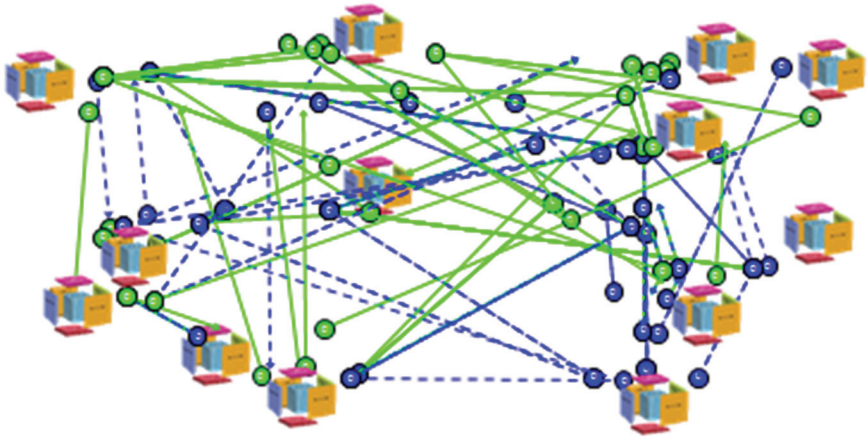

Figure 14.2 2D Mapping of a multitude of BM value exchange sequence between BM's inside a business [16].

of the persuasive BMs would begin with the 5G roll-out in the next 5 to 10 years.

Both users, customers, networkpartners, employees and businesses of today – in general will find initially those persuasive business models and persuasive business model innovation processes highly risky, foreign and radical related to existing BM's and BM innovation processes – that they've been experimenting with in their past. Certainly society and politicians need soon – and fast – involve themselves in the debate and rulemaking of Persuasive Business Modeling.

The history of the persuasive business model concept is still relatively young. As 3G and 4G based business ecosystems emerged, many business (Google, Face book, Amazon, Ebay, Zinga, Blizzard began rethinking their business model and business model structure [16]. They began to build in persuasive components (motivating colors, text, tabs, sounds), dimensions (value propositions, value chain activities, relations and networks) even BM's which could "motivate" – some would say "persuade" – users, customers, network and employees to certain behaviors. These attempts were initially rather simple and have up to for some years ago been very harmless and relative simple constructed.

However when highly professional promotion experts, psychologists, sociologist, computer scientist and business model experts are brought together in interdisciplinary BMI teams with the aim of creating persuasive business models – then the next generation persuasive business model

innovation could really begin and find their way to Business Model Ecosystems (BMES). If no control and influence – then situations where people, business and machines forget to take human and society ethics into consideration begin to emerge.

Persuasive business models demands therefore several and different competences and this is exactly where we expect BMI investment in next coming years will be focused by many businesses.

The persuasive business model approach bring the business model in to a more advanced step compared to previous development – a new era – by answering the question –

What if we really could use the sensors and the mega data they generate and could create knowledge in real-time interaction with people, things and businesses – to really "influence" or "persuade" for certain behaviors?

It proposes that the persuasive business model in a world of 5G becomes a business model framework that is reasonably simple, logical, measurable, comprehensive, operational and meaningful. The persuasive Business Model we propose as related to 7 dimensions can be seen in Table 14.1 [16].

Our previous research [13] show that a persuasive business model at an optimum adapt a multi business model approach combining and relating

Table 14.1 Generic dimensions and questions to any persuasive business model [16]

Dimensions in a Generic BM	Core Questions Related to a Generic Persuasive BM
Value proposition/s (products, services and processes) that the business offers (Physical, Digital, Virtual)	What are our value propositions?
Customer/s and Users (Target users, customers, market segments that the business serves – geographies, physical, digital, virtual).	Who do we serve?
Value chain [internal] configuration.(physical, digital, virtual)	What value chain functions do we provide?
Competences (assets, processes and activities) that translate business' inputs into value for customers and/or users (outputs). (Physical, digital, Virtual)	What are our competences?
Network – Network and Network partners (strategic partners, suppliers and others (Physical, digital, virtual)	What are our networks?
Relations(s) e.g., physical, digital and virtual relations, personal. (Physical, digital, virtual)	What are our relations?
Value formula (Profit formulae and other value formulae. (physical, digital, virtual)	What are our value formulae?

different "ingredients" from more than one business model, meaning that persuasive business models are in relations with other persuasive business models and they have embedded, interactive, dynamic persuasive technology built in.

It can be argued that strategy [16], are simply embedded with the persuasive business model approach, providing the larger platform for the business who strategically have decided to be based upon and act with one or more persuasive business models.

With other words – a persuasive business model includes an interactive, dynamic business model and business model innovation strategy vision, mission and goal(s) where the PBM seeks to achieve impact on business models including users, customers, and technologies – all dimensions of other business models [16].

The persuasive business model will in this context by nature try to attach to anything, anybody, anywhere and anytime – with the overall aim to "persuade". 5G is expected to be the backbone of these persuasive business models and persuasive business model ecosystems.

5G enables both the vision of creating persuasive business models any time, any place, with anybody and anything. In the future all human beings, all things at any time and in any place will have the possibility to act persuasively.

We expect that the persuasive business model based on advanced sensor- and persuasive technology will indeed not only be important but also add increasingly high value to the stakeholders involved. However we still have some challenge to overcome before we reach a final destination where all business models are persuasive in a world of 5G – hereunder hopefully respecting and acknowledge security, trust and ethic challenges.

An even stronger focus on security, personal security, and network based security technology must be expected of a 5G world. Business models that are continuously persuasive, in process and changing – run by businesses, humans but importantly more and more machines – continuously in different BMES context sets 5G business and researchers under high pressure to quickly find solutions – both technological and business wise to meet the requirements of all kind of stakeholders for increasing agility, flexibility, individualization, privacy related to persuasiveness.

A concept proposal for persuasive technology and business models which are independent of time, place, bodies and things – and at the same time are secure was proposed earlier (Lindgren 2016) as seen in Figure 14.3. This was however shown as proposed in a first generation proposal – an "ecosystem" of secure persuasive business model innovation showing the future context

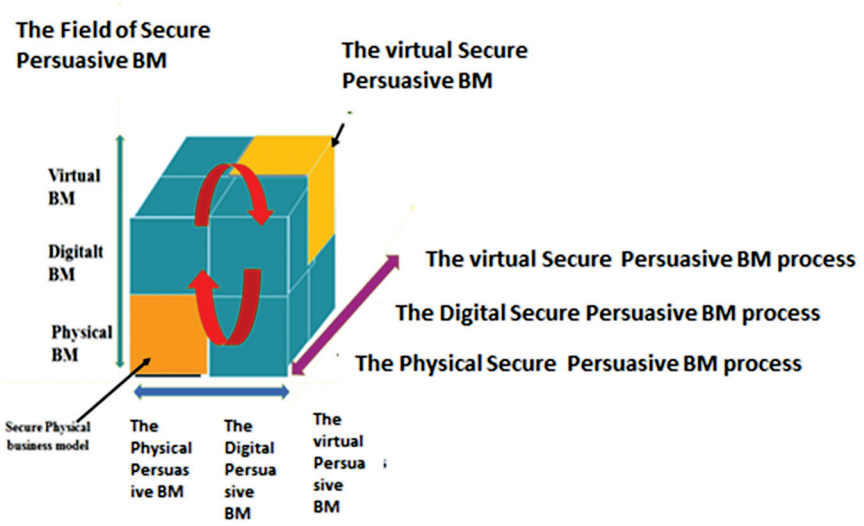

Figure 14.3 A "ecosystem" of the secure persuasive physical, digital and virtual business model [16].

to come – the full integration between physical, digital and virtual persuasive business models operating in a secure context [16].

The fulfillment of embedding persuasive BM's anytime, anyplace, with anybody and any things seems to be achievable in the very near future of 5G. Persuasive business models in a world of 5G will not only be a matter of security on the "surface" of things, places, people, animals and time but also will be about persuasive business models placed both inside and outside things, bodies, species and time.

14.5 Conclusions

Persuasive business models in a world of 5G we expect will become one of the most important BMI concepts for future business and business model innovation. It will also be one of the most discussed topics related to ethics, trust a security – actually the discussion has already begun [16].

Persuasive Business Models are integrated and embedded with advanced persuasive business model technology. It is in this context that the fast evolvement of persuasive business models related to the vision of the secure, persuasive and sustainable business; business model ecosystem, business model ecosystems and world of 5G should be seen.

The secure persuasive business model concept has not yet been fully realized – but business and societies in general continue to evolve and embrace new perceptions of persuasive business models as the challenges of business model innovation gets more complex, their business models lifetime shrinks and the opportunities of the persuasive business model growths with the emerging world of 5G.

Persuasive business models will exist in physical, digital and virtual worlds – operating in a continuous process – integrated, agile, dynamic and better connected business model ecosystems. Delivering in a continuously process of persuasive value propositions – wherever, whenever, whatever the user, customer, network partner, employees, things and business demands it. Persuasive business models will at an optimum operate together in a multi business model setup – a business model network collaboration outside and inside things, bodies, species and businesses in the future.

One must imagine that all 7 dimensions of a persuasive BM can and will change continually in a world of 5G and persuasive business model innovation processes. This makes it extremely difficult to measure, control persuasive BM and BMI processes and thereby control and leadership from outside either it is a user, customer, network partner, competitor or society is highly necessary to begin.

Expectations are that majority of all future business models will be persuasive. This of course only if human being, global society and the business behind the business models including the technology will allow it.

Future persuasive business models will use and take advantage of all opportunities of the 5G technologies given. How persuasive business models can be controlled in this context is however still for the 5G community to discuss and research.

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