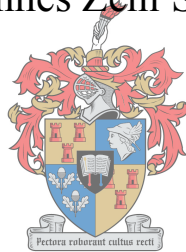# Knowledge Development through Regulation: A Case Study of the Knowledge Contribution of the Public Regulator to Electronic Bingo Technology

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Master of Philosophy in Information and Knowledge Management
in the Faculty of Arts and Social Sciences at Stellenbosch University

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Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Summary

Knowledge development for innovation often occurs in a regulated environment, raising the question whether regulation inhibits knowledge development. In most regulated industries, organizations are required to submit their new products to a regulator to get approval pre-diffusion for consumption. Innovating organizations routinely perceive those responsible for implementation and enforcement of the regulations as incompetent, lacking in both understanding and capacity to evaluate the new innovations. The typical regulator's strategic knowledge posture is therefore regarded as knowledge exploitation of already existing products and services, due to the perceived lack of incentive to enable innovation and knowledge creation.

Classical economic theory affirms the view of regulation as a compliance burden that increases opportunity costs for innovating organizations, since many resources used to comply with regulatory requirements could have been used for innovation efforts instead. The Porter Hypothesis (1991) counters this view of the relationship between regulation and innovation based on empirical evidence that, where the environment allows, regulation induces innovation and enhances competitiveness.

The thesis proceeds from the Porter Hypothesis and aims to highlight specific instances where knowledge development was enhanced by the regulator. To do this, the thesis focuses on gambling regulation in South Africa and takes the development of the Electronic Bingo Terminals (EBT) gambling product as a case study. Through document review and interviews of stakeholders in the EBT product development and regulation process, empirical evidence is presented of instances where the public regulator induced knowledge development and supported innovation. A data analysis framework inspired by Boisot's (1998) I-space and Schumpeterian learning is used to analyse the interview and documentary data about how the EBT product came into existence and to highlight the knowledge creation and development aspects identified in the process of evaluating and approving the EBTs by the public regulator.

It is demonstrated that the EBT product was unlikely to meet the diffusion requirements and the success thresholds in the gambling market without the knowledge contribution from the public regulator. The contribution from the regulator was found to spring from knowledge embedded in its employees, their practices and operational methods. For this reason, it is argued that such contributions are likely to manifest in other products and approval requests. It is

concluded that the public regulator supported knowledge development in several ways in the case of the development of EBTs and that a closer look at regulatory knowledge contribution offers an important perspective on the management of knowledge for innovation.

Opsomming

Kennisontwikkeling vir innovasie vind gereeld in 'n gereguleerde omgewing plaas, wat die vraag laat ontstaan of regulasie kennisontwikkeling inhibeer of nie. In die meeste gereguleerde industrieë word van organisasies verwag om toestemming van die reguleerder te kry alvorens nuwe produkte versprei mag word. Innoverende organisasies sien gewoonlik die reguleerder as inkompetent, met 'n tekort aan beide insig en vermoë om die nuwe produkte te evalueer. Die tipiese reguleerder se strategiese kennishouding word gesien as kennis-eksploitasie van reeds bestaande produkte en dienste, aangesien die insentief om innovasie en kennis-skepping te ondersteun blyk te ontbreek.

Klassieke ekonomiese teorie bevestig die siening van regulasie as 'n nakomingslas was die geleentheidskoste vir innoverende organisasies verhoog, want baie bronne wat toegespits word op regulasies kon eerder vir innovasie gebruik word. Die Porter Hipotese (1991) stem nie met hierdie siening van die verhouding tussen innovasie en regulasie saam nie, gebaseer op empiriese bewyse dat, waar die omgewing toelaat, regulasie innovasie kan induseer en kompeteerbaarheid verbeter.

Die tesis beweeg van die Porter Hipotese uit en poog om spesifieke gevalle waar kennisontwikkeling deur die reguleerder ondersteun is te bespreek. Die tesis fokus op dobbelregulasie in Suid-Afrika en beskryf 'n gevallestudie van die ontwikkeling van Elektroniese Bingo Terminale (EBTs) as 'n dobbelproduk. Deur dokument-analise en onderhoude met persone betrokke by die produkontwikkeling- en goedkeuringsproses van EBTs, word empiriese bewyse aangevoer van geleenthede waar die publieke reguleerder kennisontwikkeling en kennis-skepping aangehelp het. 'n Data-analise raamwerk geïnspireer deur Boisot (1998) se I-space en Schumpteriaanse leerproses is gebruik om die onderhoud en dokumentêre data te analiseer oor hoe die EBT produk ontstaan het en om die kennis-skepping en kennisontwikkelingsaspekte te identifiseer in die proses van evaluasie en goedkeuring van die EBTs deur die publieke reguleerder.

Daar word gedemonstreer dat die EBT produk onwaarskynlik die verspreidingsvereistes en die suksesmerk in die dobbelmark sou bereik het, as dit nie vir die kennisbydra van die publieke reguleerder was nie. Daar is gevind dat die bydrae van die reguleerder van die kennis ingebed in werknemers, hulle praktyke en operasionele metodes spruit. Vir hierdie rede word geargumenteer dat sulke bydraes moontlik ook in ander produkte en goedkeuringsnavrae

neerslag mag vind. Daar word afgesluit met die waarneming dat die publieke reguleerder kennisontwikkeling op verskeie maniere ondersteun het in die geval van EBTs en dat regulatoriese kennisbydraes 'n belangrike perspektief bied die bestuur van kennis vir innovasie.

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Abbreviations

BPR   Business Process Re-engineering

CA   Certifying Authority

CASA   Casino Association of South Africa

CEO   Chief Executive Officer

CET   Classical Economics Theory

CMS   Central Monitoring Systems

EBT   Electronic Bingo Terminals/Technology

ERP   Enterprise Resources Planning

GRC   Gaming Review Commission

IAGR   International Association of Gaming Regulators

ICT   Information and Communication Technologies

JIT   Just in Time (Lean production)

KM   Knowledge Management

LOC   Letter of Certification

LPM   Limited Payout Machines

MGB   Mpumalanga Gambling Board

MIT   Massachusetts Institute of Technology

MPB   Managed Professional Bureaucracy

NGB   National Gambling Board

NRCS   National Regulator of Compulsory Specifications

OECD   Organisation for Economic Co-operation and Development

PO   Product Owner

PSF   Professional Services Firm

R&D   Research and development

RTP   Return to Player

SABS   South African Bureau of Standards

SANAS   South African Accreditation System

SLC   Social Learning Cycle

TBVC   Transkei, Bophuthatswana, Venda and Ciskei

TQM   Total Quality Management

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Chapter 1 – Introduction and methodology

1.1   Introduction

Given the constant and rapid changes in the environment, it is commonly expected that for organisations to progress and improve they must constantly find new and efficient products. This is not only important for survival, but also a crucial source of competitive advantage especially about ideas and products that are not easy to replicate. That notwithstanding, the discovery of new products and services seldom occurs inadvertently. It results from deliberate cognitive efforts of individuals and teams who create, share, and develop knowledge through various processes.

The discovery of new knowledge is only a means to an end. Firms must continuously and systematically develop and apply the found knowledge to an ever-increasing range of processes, some physical and others intangible (Boisot, 1998, p.2). Knowledge development is the basis of innovation, which is the basis of new products and thus a source of competitive advantage. It therefore follows that knowledge development, which is an element of broader knowledge management (KM), is the source of new products and thus a competitive advantage (Newell et al., 2009, p.233).

Knowledge development is a collaborative process which in some instances occurs amongst competitors, regulators and the regulated. Through collaboration, partners share ideas, expertise, resources and bring together a broader set of complementary skills and talents. This results in a more responsive work culture, innovative thinking, and creativity which all augurs well for knowledge development (Cankar and Petkovsek, 2013, p.1597). Through collaboration knowledge development is fast-tracked and enriched, thereby yielding better and more efficient products and services (Cankar and Petkovsek, 2013, p.1597 and Newell et al. 2009, p.92).

The Organisation for Economic Co-operation and Development (OECD) which is a forum for democratic market economies that promotes economic growth and sustainable development, suggests that

> *"throughout history, innovation has relied on collaboration among different economic actors – in particular among producers, who can see that the collective production of knowledge and innovation (associated today with advancing collaborative technology)*

can sometimes yield a greater economic return than simple competition". (OECD, 2004, p.22).

Knowledge development, and innovation, are thus be considered as the *"sole means of survival and prosperity in the globalised economies"* (OECD, 2004, p.22).

The collaborative nature of knowledge development and innovation must at times increasingly occur in a highly regulated environment wherein the innovator is required by regulations to submit their innovations to a regulator who must review and approve. In such scenarios, both innovation and regulation, consequently innovators and regulators are heavily dependent on knowledge, particularly its creation and diffusion. Essentially, innovation is embedded knowledge in case of products, and embodied knowledge in services.

Innovators embark on extensive experimentation, research and development in their endeavour to create new products and services. This often takes years of conceptualisation, testing and retesting before presentation to the regulator for approval and permission to diffuse. Similarly, upon receipt of the new product or concept, the regulator must in each case analyse the product and authorise it individually after going through all stages of analysis (Taylor, Rubin & Hounshell, 2005, p.349). This also requires a significant amount of either tacit or explicit knowledge input from the regulator since it is expected that they too must conduct experiments, research and testing, albeit of a different kind.

Therefore, at both sides of the innovation spectrum, knowledge development processes must be sound and alert to the requirements at any given point. This thesis explores these knowledge development variables for innovation, in the regulated gambling environment where the innovator is legally expected to collaborate with the regulator pre, and post-diffusion of gambling products through statutory submissions and approvals.

1.2   Purpose and focus of the study

Whilst innovation and regulation form a critical part of this thesis, it should be noted at the outset that this study is not about these concepts. As such, the salient debates of whether regulation is good for innovation, arguments for and against it, further definitions of such concepts or their need in society are not discussed extensively. From the understanding that the innovation scope of public regulators is confined to legislative prescripts and policy mandates, the focus here is not on innovation efforts of the regulators to improve regulatory processes but on their frequently unconscious and unquantified knowledge contribution towards the private

sectors' products. Therefore, the interest of this thesis is biased towards the knowledge contribution aspect of public regulators into knowledge development for innovation.

For purposes of this thesis, public regulators are regarded as those *"government agencies that are responsible for the exercise of autonomous authority over specific areas of human activity in a regulatory or supervisory capacity"*. These are agencies that *"deal in the area of administrative law, regulation or rulemaking (codifying and enforcing rules and regulations and imposing supervision or oversight for the benefit of the public at large)"*. Their existence is *"justified by the complexity of certain regulatory and supervisory tasks that require expertise, the need for rapid implementation of public authority in certain sectors, and the drawbacks of political interference"*. These agencies typically *"perform investigations or audits, and others may fine the relevant parties and order certain measures"* (Wikipedia, 2016).

The premise and context herein is based on private sector initiated products that are submitted to the public regulators, particularly in the regulated gambling industry in South Africa, for review and approval pre-diffusion for consumption by the intended market – post-diffusion. It has been noted that in the regulated gambling industry, the submission and review for approval of new products is a compulsory minimum legislative process that cannot be circumvented by the product owner (PO), nor by the regulator. This thus renders such an industry appropriate in highlighting the knowledge development for innovation dimension by the regulatory agencies concerned.

Using a model product, i.e. EBTs, which are a form of gaming apparatus used in the Bingo sector, the study identifies and analyses the regulator's processes and their impact on the model product using knowledge management theory espoused in Newell (2009) and aspects of Boisot's (1998) I-space analogy. As an outcome, it is expected that the analysis will be crucial in explaining and describing the contribution of such institutions in innovations, evaluate existing practices, develop theory and point out implications for knowledge work where necessary.

1.3   Research questions

The study attempts to answer the following questions:

i)   What is the knowledge value of the public regulator in the gambling industry innovations and is it appropriately credited?

ii)   How does the public regulator contribute to knowledge development for innovations (specifically in the regulated gambling industry)?

iii)   Is the regulator consciously structured and organised to support knowledge creation and knowledge work?

1.4   Anticipated contribution

Limited KM research regarding public sector organisations and public regulators in particular was identified. Although it is important and growing in statute and despite its information and knowledge intensity, as far as the author is aware, no KM research was conducted in the regulated South African gambling industry.

The literature review in this thesis shows that the regulation-innovation phenomenon is best highlighted by industry and context specific empirical investigations and analysis. Therefore, this thesis builds on this approach by focusing on one industry i.e. regulated gambling, one regulator therein and particularly one product, which is the EBT.

As such, it is anticipated that this research will not only contribute to the KM discourse in general but will unearth and highlight particular regulation-innovation related KM issues that are peculiar to the public sector and the gambling industry. From thereon, it is anticipated that this research may highlight regulation-innovation KM issues of the public sector and spur on further research in that direction. Research in this regard has been found to be inadequate.

It is also anticipated that the research will be useful in policy issues around regulation and innovation by determining and highlighting the role of public institutions such as regulators in this process. By analysing innovation from the context of knowledge development in a regulatory environment, it is anticipated that the key contributors to such a process will be identifiable and result in the creation of particular programmes and support mechanisms.

Furthermore, questions as to whether regulatory institutions are relevant and appropriately poised for knowledge development and innovation will hopefully be answered through the study. Finally, the study will hopefully highlight the knowledge development gaps, barriers and provide appropriate theoretical constructs to help minimise or eliminate these.

1.5   Qualitative research

The aims and objectives of this thesis prompted the study towards a qualitative research approach. Using the regulated gambling industry as an example, in the main, the study was aimed at discovering and understanding the systems, perspectives and experiences of regulators and their licensees during innovation and knowledge creation. This was achieved using one such regulator in the Mpumalanga Province whereby the meaning and purpose of its actions were perused (Harwell, 2011, p.147). Therefore, the outcome herein is a matter of perspective and interpretation of the reality from the researchers' perspective, thus cannot be the single and absolute truth.

Since the research is a case study, extensive document reviews and interviews were conducted mainly to understand the case in context and to extract the relevant knowledge development practices gleaned from the available literature.

1.6   Case study

A case study is a "systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest" (Zucker, 2009: p.3). Case studies are useful and appropriate in the study of exemplary and historical cases such as the handling of the EBT product by the regulator in this regard. This strategy was considered appropriate for the research of the knowledge creation and innovation phenomenon being considered in this regard. It provided the tools to study this complex phenomenon within its context using various data sources. Since the unit of analysis can vary from an individual to a corporation, this method was applied retrospectively but will most likely be used prospectively. As such, data came largely from documentation and interviews (Yin, 1994).

This strategy was found to be highly appropriate because of "its flexibility and rigour" and valuable for the development of theory, evaluation of program and development of interventions (Baxter & Jack, 2008, p.554).

1.7   Subject of analysis

There were many products submitted for evaluation and approval to the Mpumalanga regulator (MGB) by companies in the industry. Also, there are many public regulators in the SA gambling industry. As such, to try and analyse all their cases would have been arduous and impractical, however, due to the vastly standardised systems used by regulators and the fact that they follow similar statutes, all products are subjected to similar processes. Although conducting multiple case studies is generally considered to provide more reliable and robust

results, in this regard such an approach would have been redundant. Therefore, results based on the analysis of one of the evaluated regulators can to a certain extent be applied to others.

Considering this, the study focused on the contribution of such regulators, particularly the Mpumalanga regulatory institution in the establishment and sustaining of a (then) new product referred to as EBT between 2008 and 2015. The EBT case was and is still a controversial polarising phenomenon, mainly because it did not to conform to orthodox regulatory practices and requirements. For these reasons amongst others, it was considered an exemplary case suitable for highlighting and responding to the KM questions of this research.

The MGB, which is a juristic body that conforms to this thesis' definition of a public regulator, will be used as a case study. The MGB is highly regarded in the industry as a competent and pioneering regulator. This institution held presidency of the International Association of Gaming Regulators (IAGR) in 2016 and occupied various key portfolios in such. IAGR is an organisation consisting of representatives from gaming regulatory organizations throughout the world. The MGB was selected firstly due to issues regarding access to pertinent data and personnel, and secondly, on having been at the forefront of the implementation of the EBT. The MGB was amongst the first regulators to be approached by EBT initiators for evaluation and approval of the product.

This case study comprised of an empirical investigation of the knowledge development processes and the impact of the regulator contexts when it was first approached to evaluate the model product. To highlight the regulators' contribution, the study evaluates the product's salient characteristics, attributes and operational requirements pre and post-submission to the regulator. This effectively responds to research questions one and two, i.e. whether the regulator influenced the shape and form of the product and how it was done.

1.8   Data collection approach

1.8.1   Document reviews

The regulatory process of introducing new products like the EBTs in a gambling market is regulated and involves multiple players. It is also technical and highly specialised. At a high level, national legislation and technical standards prescribe the requirements for new equipment.

However, the provincial regulators prescribe and have discretion on the processes of introducing the product in the respective provinces. The technical standards, national and provincial legislation are a matter of public record and therefore can be accessed through

various platforms. Although the provincial legislation provides a high-level explanation of the processes to be followed, a more detailed account of the specific processes is exclusively contained in internal documents that are not published for public consumption.

For this thesis, the MGB allowed the investigator access to the inspection manuals and operational procedures in the department directly responsible for new product evaluations and approvals. It was found that the submission and approval process is typically conducted through electronic mediums. However, in case of the EBT evaluation, manual processes were used since they allow more space for engagement between the relevant parties (MGB, 2007).

Therefore, access was granted to the various correspondence between the regulator and the initiator of the product, as well as other submissions from external parties interested or affected by the introduction of the product. This mainly comprised of formal letters between and amongst the parties. The compendium of correspondence in this regard was useful in the understanding of the collaborative aspect of knowledge development about the product since it highlighted the various inputs from others from which the regulator's position was gleaned.

Access to the information about the product itself was needed and it was also obtained. This information contained test reports from the laboratories and the certification issued by the certifying authority (CA) issued for different variants of the EBT product. Such information was crucial in the understanding of the technical and administrative operations of the product which thus helped shape the conclusions on how the regulator contributed in developing knowledge that changed the product, or that aided its diffusion for consumption. Confidentiality and protection of the identities of the parties was common cause, hence the exact technical details of the product(s) and the initiator are not expressly mentioned in the study.

Due to the public interest on the product, additional information concerning it was gleaned from media publications and court submissions, which was also crucial in highlighting the regulator's contribution. Access to such information was not particularly an issue of constraint, instead the challenge was in narrowing it in terms of relevance to the study.

Furthermore, the regulatory mandate and objectives of the regulator as indicated in their published documents, such as annual reports, brochures and website, were considered to determine the extent to which such support knowledge creation and to determine the impact of their posture on products such as the EBT product. Such records are also a matter of public record, however, permission to use such was also obtained.

1.8.2   Semi-structured interviews

1.8.2.1   Selection criteria

Whilst the documentation alone provided valuable empirical data highlighting the contribution of the regulator, this had to be augmented by oral accounts of people who were involved in the processes of developing knowledge for, and about the product before its diffusion for consumption. The interviewees' experience in the pre-diffusion process was important in highlighting the tacit and, or explicit knowledge management principles applied during the evaluation of the product. Such people have been in constant interaction with other parties, such as fellow regulators and manufacturers of similar products within and outside of their jurisdiction. As such, this group was a rich resource of knowledge regarding the processes involved in the approval and diffusion of the product under consideration and other products in general.

Further to the above criteria, the persons selected for the interview must have been involved in the process of rolling out the product after approval was granted by the regulator, as such, they possessed intimate technical knowledge of its functionality and features which was important in highlighting the differences in the product before and after approval. This allowed the contribution of the regulator to be easily identified and isolated from the original submission by the manufacturer. In the third instance, the persons identified for the interviews are involved in the continuous monitoring of the product to ensure continued compliance with regulatory requirements, post-diffusion. Accordingly, they are well placed to provide further recommendation regarding continuous improvement of the product albeit from a regulatory compliance rather than a commercial perspective. Therefore, the knowledge development and management input gleaned from this group in respect of the product is longitudinal and in a constant state of flux, hence a rich field of exploration for KM research.

1.8.2.2   Sample size

Within the model regulator used for the thesis, the number of people that met the above-mentioned criteria are only six. Four of the six were at production level, i.e. Inspectors. These are the first line recipients and evaluators with technical expertise on gambling products such as the EBT under consideration in this thesis. The production worker is mainly responsible for the gathering of data and the monitoring of the gambling industry within the legislated parameters. This entails the planning of inspections such as identifying the areas of inspection, formulation of the scope, execution, and reporting on the inspection. The production level

evaluators set the tone of the evaluation and highlighted the key issues that must be considered by the next level of evaluation i.e. the operations managers.

There were two operations managers interviewed, and they in the main evaluate the work of the production workers and provide guidance in that regard. In total three of the six employees meeting the criteria were interviewed. These three interviewees constituted 50% of the people meeting the selection criteria and also representative of the two pertinent levels of evaluation of gambling products like the EBT.

1.8.2.3 Respondent's profiles

The two operations managers were directly involved in the processes evaluating the EBT and are currently responsible for ensuring continued compliance of the product as it operates. These managers have combined experience of over 30 years in the gambling industry and possess tertiary levels of education.

The other respondent has over 20 years of experience in gambling regulation and overall experience in the gambling industry of 30 years. His career started in the operational side from a casino perspective. This respondent is a production worker with the official designation of an inspector, thus responsible for the continued inspections and knowledge generation about gambling products.

Table 1: Respondents' profiles

Subject	Position	Role	Education level	Experience	Field of expertise	Current studies	Interview date
Respondent 1	Operations Manager	Management	Tertiary	+10 years	Technical	Yes.	16/11/2016
Respondent 2	Operations Manager	Management	Tertiary	+20 years	Law enforcement	None.	22/11/2016
Respondent 3	Inspector	Production	Tertiary	+30 years	Gaming Systems	None.	30/08/2017

Source: Personal collection

1.8.2.4 Interview guide

The interview guide was formulated to determine mainly three broad knowledge management requirements.

Inspired by Newell et al.'s (2009) proposition that an organisations activities must be characterised by an emphasis on theoretical knowledge, creativity and the use of analytical and

social skills; the interview guide firstly aimed at understanding the state of knowledge work and the knowledge worker in the organisation. Accordingly, basic background questions such as education, experience, position occupied, and types of training required for the position were administered. Furthermore, issues of autonomy, specialisation and esoteric skills were probed to understand the nature of knowledge work in the organisation.

Secondly, questions around the requirements for knowledge work were probed. In this regard, the interview guide required the respondent to describe their work in detail with a view to determine as an outcome, the extent of knowledge development through activities such as experiments and tests. Specific questions about project work, knowledge creation, collaboration and sharing of knowledge. The guidelines also sought the interviewees opinions and assessment in regard to what they viewed as a contribution of the regulator into the EBT product during and post their evaluation.

Conducting interviews with persons with intimate knowledge about the product enhanced the study. In the first instance, it provided an understanding of the context within which the evaluation and subsequently the approval occurred. The literature review revealed and highlighted the importance of context and specificity in studies of this nature. Documents alone cannot fully reveal a context hence they must be augmented by the oral accounts of the persons involved. The interviews, therefore, provided such an oral account.

Secondly, the interviews highlighted the level of expertise and subject knowledge of pertinent employees of the regulator. This was particularly important to test the theoretical propositions that regulators are often ill equipped, incompetent and unequal to the knowledge development for innovation challenge often posed by the innovating firms in the private sectors. The discussions varied somewhat from person to person depending on their answers.

However, in the main the personal attributes of the respondent such as experience in the field, educational levels, current and further studies, product knowledge and understanding of knowledge processes were consistent features in all the interviews. This was mainly to test the knowledge work and worker aspects of their jobs and of the organisations' employees themselves to determine consistency with knowledge management theory espoused in theoretical literature, particularly Newell et al. (2009).

Lastly, the interviews provided an important window into the employee's perceptions about the organisation's posture towards knowledge development and the innovations from its private sector licensees. This was also particularly useful in the formulation of the conclusions in this respect.

1.8.2.5   Interview process

Interviews were conducted in English, and individually at the respondents' offices after the necessary permission was obtained. These were recorded on audio, whilst key points of discussion were noted on the interview guide (Appendix 1). The first interview was conducted on 16 November 2016, with one of the two operations managers (Respondent 1); the second one was on the 22 November 2016 with the other operations manager (Respondent 2). The last interview i.e. with the production worker (Respondent 3) was conducted on 30 August 2017.

During the interviews, similar questions were put to the respondents as per the interview guide, but this was not conducted in a particular format. As such, not all the questions as per the interview guideline were directly asked by the investigator. In certain instances, the respondents provided responses that covered other aspects of knowledge work and its management. That notwithstanding, the questions followed a certain structure and contained knowledge management themes, such as the extent to which the respondent thought of themselves as knowledge workers. This was in order to determine if the regulator, through its employees positioned itself as a knowledge intensive firm so as to make a knowledge contribution to products submitted to it for approval, such as the EBT.

To probe the knowledge intensity question further, the level of education, further study, current position, the details of what this position entails and the type of training required to occupy such were discussed with the all the respondents. Further to the knowledge intensity considerations, the processes of the regulator and the respondent's role, in particular the consideration for approval of new products, were considered. Therefore, direct questions about testing and experimentation of the product were asked. Specific to the EBTs, questions were asked about the extent of collaboration, project management, knowledge creation and the respondents' direct view about how the regulator contributed to the diffusion of the product.

1.9   Data analysis

The data analysis framework was gleaned Boisot's (1998) theoretical propositions, particularly the I-space concept. The choice of Boisot's propositions was inspired by the similarities that were illuminated by the empirical findings on how the EBT product came to existence, particularly the creation and development of knowledge emanating therefrom. Boisot's submissions about embedded knowledge and the use of existing knowledge assets in people's heads, documents, and then translating them into artefacts also seemed particularly germane to the knowledge development of the EBT and by all collaborators. The I-space was particularly

relevant since it highlighted poignantly the contribution of the regulator in the final diffusion aspect of the EBT product.

The Schumpeter theoretical constructs seemed to support the view of innovations being based on previous versions of a product that are thus built upon. Accordingly, the evolution of the EBT over the years from traditional Bingo games seemed to bear many similarities with Schumpeter's theory of learning. Accordingly, the Schumpeterian analysis was brought in to support the views proffered by Boisot (1998), as well as to highlight the consistency of this theory with the knowledge creation and development aspects identified in the process of evaluating and approving the EBTs by the regulator.

The audio recordings from the interviews, were replayed during the analysis process. These responses were noted in line with the questions and discussion points contained in the interview guide. There are instances where the respondents provided more information than what was requested, and such information was also recorded and used in the analysis of the regulator's organisational context against KM principles.

1.10   Limitations of the study

The EBT case in point clearly involves several stakeholders who played distinct roles. The perspective presented herein is from one the role-players i.e. the regulator. This is appropriate since the study focused on the role of the regulator in this regard. However, within the regulator's processes certain decisions and responses were influenced by other parties, particularly the manufacturer. The study would have been greatly enriched if the perspective of the manufacturer was also explored in the context of the regulator's response to their actions.

For example, reading from the legislative requirements, it would appear as though the codification scheme of the equipment was forthright, hence the manufacture could have known the correct and applicable codification parameters. Aside from the manufacturer, there are many other parties with interest in the diffusion of the product whose views are not captured in this thesis. This question is not answered in this thesis due to the limitations of the scope.

Secondly, the product was introduced first in 2008 which is approximately eight years up to when this thesis is conducted. Therefore, some documents which are pertinent in answering the questions are no longer in the active domain or have been disposed due to the lapsed time. Furthermore, pertinent personnel who were involved in the submission, evaluation and eventually approval of the product were no longer available or employed by the manufacturer or by the regulator. For example, the line managers at the manufacturer and at the regulator

who sanctioned the submission of the product for evaluation, respectively. Therefore, their input particularly on the contextual background was not accessible hence beyond the scope of my contribution.

Chapter 2: The role of regulation and regulators in knowledge development for innovation – a literature review

2.1   Introduction

It has been submitted thus far that knowledge development for innovation requires, and thrives in a collaborative environment. However, collaborative environments free of regulations are almost non-existent and regulation is now pervasive and unavoidable (Shleifer, 2005, p.439); hence it is a key feature in product innovation, and the development of knowledge thereof. In this chapter, the thesis examines the role of the regulation phenomenon in knowledge development for innovation by reviewing existing literature related to the concepts of regulation, innovation, and knowledge. Theoretical constructs of these concepts and their definitions are proffered to lay the theoretical foundations about whether knowledge development for innovation thrives, or suffers in a regulated environment. The arguments presented by the Porter Hypothesis (1991) and CET are introduced herein to support or reject regulation as a catalyst in knowledge development for innovation.

2.2   Theoretical overview of regulation, innovation, and knowledge

2.2.1   Regulation

As a generic concept, regulation refers to the exercise of control, and, or intervention by government over the behaviour, or on the structure of firms in a market. Regulatory interventions are mainly on key variables like prices, outputs, advertising, profits and information. The structural interventions focus on the prohibition of mergers and acquisitions intended to thwart competition and aim to prevent anticompetitive market practices (Schiller, 2008, p. 547). Government regulation that covers both structure and behaviour is achieved through antitrust laws which are laws that are essentially aimed at directly changing market outcomes by imposing specific limitations on prices, outputs or investment decisions.

In an ideal market, all producers are "perfect competitors", consumers have full information about costs, prices, and the effects and benefits of the products they purchase and consume. In such an instance regulation is deemed unnecessary, hence a *laissez faire* approach. However, markets sometimes fail. For instance, in unregulated markets producers may produce the wrong mix of outputs, use undesirable methods of production, or unfairly distribute income. For such reasons, government thus intervenes through regulation. However, government intervention

through regulation can also fail due to inefficiencies and compliance burdens which plunge the industry into an undesirable state. Sometimes, it is argued, a worse state prior to the government intervention prevails (Schiller, 2008, p. 547).

On the other side of government intervention through regulation is the argument for deregulation. The deregulation proposition rests on the observation that government intervention through regulation sometimes worsens market outcomes and that the failure of the markets by themselves is lesser than the government failures – i.e. government intervention that fails to impose economic outcomes (Schiller, 2008, p. 555).

Questions therefore arise as to when to regulate an industry and what is the proper form of regulation. Likewise, when is it the appropriate time to deregulate an industry. Despite these considerations, it is clear that both the markets and the government interventions are imperfect. Regulation therefore presents the difficult but necessary considerations and choices between the imperfect markets and the imperfect government interventions.

2.2.2   Innovation

Innovation is an expansive multifaceted concept which has been discussed and defined in widely available studies and literature. Its processes include identifying a problem or opportunity, developing new ideas, diffusion of the ideas and implementation of the solution (Newell, 2009, p.188 & Cankar and Petkovsek, 2013, p.1597). All these are knowledge intensive endeavours. Cankar and Petkovsek (2013, p.1597) sums innovation as the creation of better products, services, processes and technologies, hence, it is a result of a complex use of ideas. Ideas which are a factor of knowledge and its processes.

In broad terms, innovations are classified into products and processes respectively termed technical, and administrative (Newell et al., 2009, p.189). The first kind results in tangible products whilst the latter results in a change in production processes. They also vary in degree with some resulting in revolutionary changes, thus aptly termed radical, whilst others may result in evolutionary type of changes (Ashford & Heaton, 1983).

Innovation comes in many different forms, sometimes as a circumvention of compliance requirements imposed by regulators, at times as improvements to existing products or as completely new products or services (Stewart, 2010). There are many and varying definitions of innovation, most of which refer to the generation (invention), spread (diffusion) and application (implementation) of ideas in practice (Newell et al., 2009, p.169). Some definitions

such as Schumpeter (1942) extend the requirements for innovation beyond invention and diffusion to require the successful commercial application of an idea. The Schumpeterian view finds resonance in Cankar & Petkovsek (2013, p.1598) who also emphasise that the idea must be accepted by government and society to be considered as innovation. As Jaffe et al. (2002, p.43) states, innovation can also occur without invention when an idea that was never commercialised is brought to the market.

Notwithstanding any of the definitions, a key component of innovation is knowledge creation (Newell et al., 2009, p.234). Therefore, the form in which it comes is of little importance and perhaps no consequence. The reality of the knowledge and globalised economy is that companies and societies are required to spend more time and resources producing new ideas to align and even anticipate changes in the environment (OECD, 2004). That notwithstanding, innovation discussions are at a higher level with little to no emphasis on it as a product of knowledge and its processes. For such reasons, the input and contribution of other collaborators, explicit or tacit, formal or informal, and deliberate or unintended, is often not recorded, recognised and credited.

2.2.3   Knowledge

The definition of knowledge is somewhat controversial but the epistemologies of possession and practice have largely stood out. Proponents of the epistemology of possession regard knowledge as the property of the knower, which in the same way as any other possession that can be transferred, developed and applied. From the perspective of possession, knowledge is presented in a form of a pyramid (Figure 1) comprised of data which is articulated to information, to knowledge and wisdom at its peak. Data is regarded as an independent entity which exists out there without any meaning, whereas information refers to data that has been organised. The epistemology of possession posits that knowledge is the personal possession of the knower, who then confers meaning to information and data by drawing from their frame of reference (Newell et al., 2009, p.14).
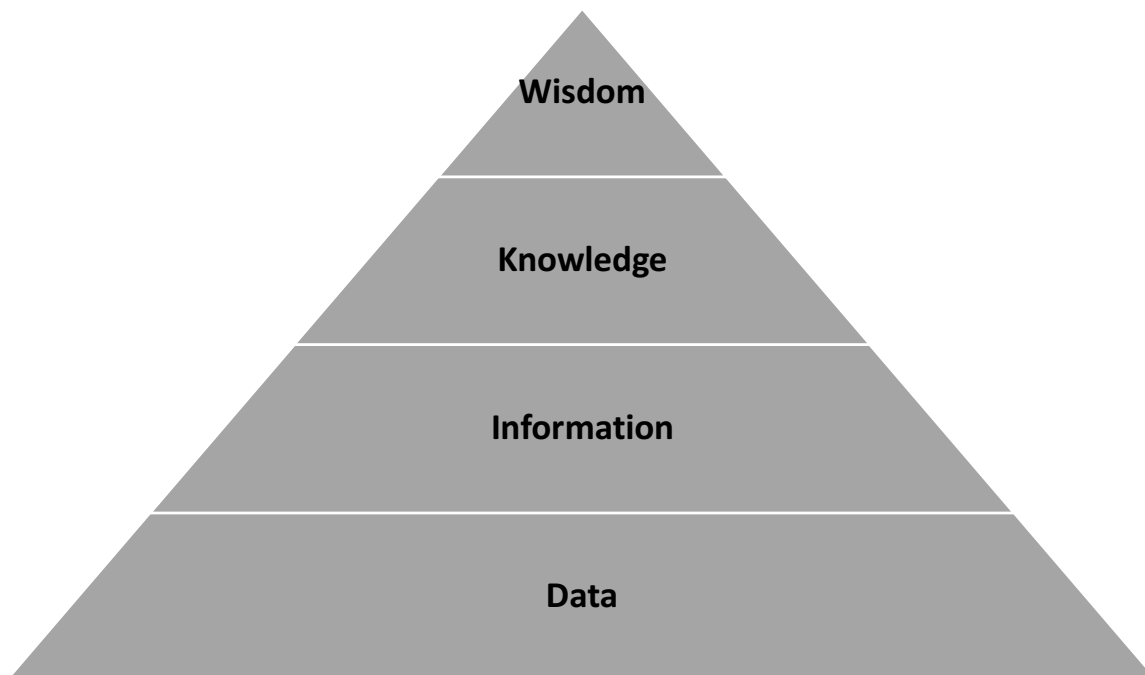
Figure 1: Knowledge Pyramid

Source: Newell et al. (2009, p.3)

On the other hand, the epistemology of practice holds the view that knowledge results from social interactions wherein tacit knowledge is converted to explicit knowledge which is then transferred from one person to another and thus related to the knowledge of a wider community. The knowledge as practice epistemology further posits that knowledge can be observed through the practices of a group or individuals which are inextricably bound up in the way these groups or individuals develop shared identities and beliefs (Newell et al., 2009, p.4). There have been several attempts to reconcile these definitions, e.g. Cook & Brown, (1999) as cited in Newell et al. (2009, p.16) who opined that knowledge is used by both individuals and groups either explicitly or tacitly in all their activities. Cook & Brown (1999) saw knowledge and knowing as mutually enabling processes.

Other contributors to the subject of knowledge such as Newell et al. (2009), see knowledge as the ability to discriminate within and across contexts. Whilst Tsoukas & Vladimirou (2001) also cited in Newell et al. (2009) hold that context and theory are both important. Therefore, in the context of organisations; knowledge is regarded as the shared norms, understandings and practices that integrates actors and artefacts to produce desired outcomes. The common thread emerging from these definitions of knowledge is that it is a dynamic phenomenon with many dimensions and a property of memory and not data. Accordingly, it is expressed in embedded and codified forms, signified in one's capacity to act intelligently (embodied), delegated to automata and recordings (codified) (Kinghorn, 2014).

2.2.3.1   Knowledge processes and types of knowledge

Using Nonaka's widely accepted and quoted SECI model, knowledge creation processes are largely identified as socialisation, externalisation, combination and internalisation (Newell at al., 2009, p.8). Fundamentally, the SECI model defines a cyclical process of interactions and conversion of knowledge between explicit and tacit knowledge. On the basis that organisational knowledge begins with the individual, the socialisation aspect of the SECI model occurs during interactions between individuals. In this regard, tacit-tacit knowledge conversions occur and will remain undiscernible until externalisation which is about tacit-explicit knowledge conversions occurs. Other processes like internalisation and combination refer to explicit-tacit and explicit-explicit knowledge conversions.

That notwithstanding, the SECI model does not necessarily suggest that knowledge creation only occurs at the individual level, but recognises the role of other stakeholder such as organisations and their managers. Nonaka emphasises the importance of the establishment of a context that enables knowledge creation within organisations. Nonaka & Komo (1998), as cited in Newell et al. (2009, p.8), define context as the "shared space for emerging relationships" and such space can be physical, virtual, mental or a combination of all these dimensions. Furthermore, Newell et al. (2009) argue that knowledge is embedded in the context where it is acquired through individual experiences. As such, the knowledge processes of socialisation, externalisation, internalisation and combination occur in the contexts of originating, interacting, cyber and exercising.

Though popular and widely accepted, Nonaka's SECI model is criticised for presenting an overly individualised perspective of knowledge amongst many of its highlighted shortcomings. As such, alternative knowledge models such as Spender, (1996) & (1998) frameworks also offer proposals for knowledge creation. Whilst Nonaka's SECI model is premised on the conversions between tacit and explicit knowledge, Spender's framework is further concerned about where the knowledge resides. As such, Spender (1996) & (1998) also distinguishes between individual and collective knowledge over and above explicit and tacit considerations.

Another prominent knowledge framework besides Nonaka's and Spender's is Blackler's (1995) framework which essentially depicts knowledge as embrained, embodied, encultured, embedded and encoded. Blackler (1995, pp. 1024-1025) describes embrained knowledge as knowledge that is dependent on conceptual skills and cognitive abilities, whilst embodied refers to action oriented knowledge. Encultured knowledge refers to organisations' shared

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understandings, embedded refers to systemic routines and encoded is information conveyed through signs and symbols.

2.2.3.2   Distinguishing knowledge from data, and information

Knowledge should not be confused with data and information; however, these constructs are important in its creation. Whilst the epistemology of possession expresses knowledge as a consequence of data and information, such an analysis is partially correct and appropriate in explaining the workings of computers. Nevertheless, as a definition of knowledge in general this materialists' definition is incorrect (Kinghorn, 2014). There are significant differences in the concepts of data, information and knowledge and these have been conflated and purported to explain the concept of knowledge.

Data is a concept that became frequently used in the advent of quantitative analysis and emphasis on it dramatically increased as a key concept in the era of computation. This notion bears multiple meanings depending on the context in which it is used. It should be noted that data does not necessarily mean facts and necessarily neutral but, just like information and knowledge, it is the construct of the human brain. Information, on the other hand, is inherently a communications concept produced for a limited time-span, and once it has been consumed, it ceases to be information. Whilst it has the potential to support knowledge, it can only succeed if it conveys meaning (Kinghorn, 2014).

The framework of knowledge economics as used by Boisot (1998, p.21) provides an appropriate analysis of the concepts of data, information and knowledge particularly in the context of organisations' quest for competitive advantage. Accordingly, Boisot explores the role of data, information and knowledge in the factors of production such as labour and capital. He explores these from Agrarian, industrial (Neoclassical) and knowledge based economies (evolutionary). The central theme in Boisot's notion, as also is the case with economics, is the concept of scarcity particularly of the physical factors of production such as labour and land. Given the constraint of scarce resources, it thus becomes important to ensure a cautious use of resources such that output always exceeds input.

Agrarian economies in the 19th century relied heavily on nature, human and animal energy (Boisot, 1998, p.21). It was only during the 20th century when capital in the form of machinery and other forms of production product introduced. The problem with energy based production is the concept of locality, therefore, the introduction of capital reduced the use of human and animal energy in the production process which was the pillar of the century in Agrarian economies. This made production easier, more accurate, predictable, and efficient. However,

in order to function, the factors of production required all embodied notions of data, information and knowledge.

2.2.3.3 Uses of data, information, and knowledge

The role of data in this regard as Boisot (1998) sees it, is to discriminate and illuminate physical states of things. Therefore, data states what the things are, hence it nuances what they are not, for example, the colour, size and quantity. On their own, these descriptions of objects have no informational value or meaning. Information is derived from the data by an agent depending on the agent's prior knowledge which can include memory and experience. The agent therefore attaches meaning to data, which can thus be termed as information (Weick, 1995, p.5). Knowledge on the other hand is the economising of the information derived from data to ensure savings in the use of space, time and energy. The economising is done by embedding the data sources into physical artefacts thereby modifying their data structures and information bearing capacity.

Knowledge organises the physical resources by embedding them in information documents and systems. It is worth noting, however, that knowledge cannot be directly observed but can only be inferred through the actions of the agents (Boisot, 1998, pp.12-13). Boisot's hypothesis regarding knowledge indicates fundamental differences in the outcome of exploitation processes of knowledge in the neoclassical and the evolutionary production regimen.

In the neoclassical sense, Boisot argues that new knowledge in some cases results in an increased consumption of physical resources to save data-processing resources. However, in the current evolutionary production function, more data resources are used over physical resources such as labour and land. Therefore, an inverse relationship exists between physical resources (e.g. labour) and data resources (capital), such that the more data is accumulated on a system the less use of physical resources becomes necessary (Boisot, 1998, p.31).

2.2.3.4 Neoclassical (N), and Schumpeterian (S) Learning

Boisot's theory of learning hinges on the information space (I-space), which is a conceptual framework that explores the relationship between codification, abstraction and diffusion of knowledge Boisot (1998, p.58). Since data and information have become factors of production in the new knowledge economy, they have and continue to substitute physical factors of production such as labour through learning processes that increase the data and information consumption, processing and economising. In recognition of the important role of data and information in the evolutionary economy, firms invest in the creation of knowledge to secure

competitive advantage. The result of such investments is the generation of copious amounts of non-homogenous knowledge which yield little value to the firm unless it is adequately codified, abstracted, and diffused.

Codification is about partitioning the data into perceptual and conceptual categories. This can result into too many categories of data being created rendering the data ineffectual, especially if the phenomenon being codified is complex (Boisot, 1998, pp.42-45). The limitations of codification are compensated by the process of abstraction which gives broad structures to the data, thus minimising the number of categories. The latter part of the process is diffusion which is about dissemination and broadcast for wider consumption and use until it becomes common sense. Boisot's hypothesis also proffers that the data trajectory in the I-space is not always unidirectional towards greater codification, abstraction, and diffusion, it can also travel in the opposite direction (Boisot, 1998, p.58). The concepts of N-learning and S-learning illuminate and differentiate between the two trajectories of data in the I-space.
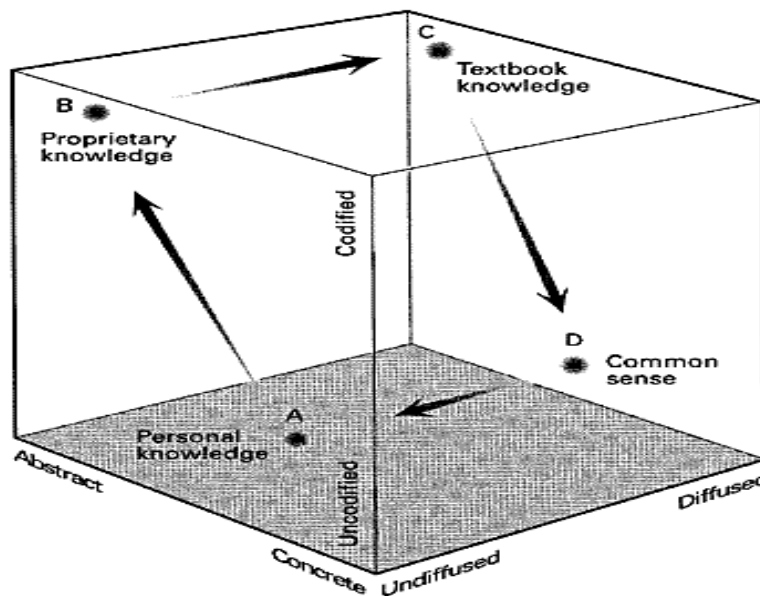
Figure 2: The I-space

Source: Boisot (1998)

2.2.3.5   Neoclassical(N) learning

Using the concept of N-learning, the I-space hypothesis attempts to describe a learning process wherein knowledge that has been accumulated over time is a more accurate representation of a phenomenon. This knowledge is held in such high regard since over the cause of its generation, incorrect knowledge and errors were identified and gradually weeded out. The knowledge acquired through the N-learning process is gradually disseminated to the population

and in the process, it replaces faulty knowledge. However, knowledge acquired through N-learning reaches a point of inertia which could mean that a high level of reliance can be placed on it since it provides a solid base of robustness and trustworthiness.

On the contrary, the state of inertia could mean that any foundational errors committed in the creation of such knowledge are entrenched and so inherent in the knowledge that it will be difficult to disentangle. The continued economic value of knowledge acquired in the N-learning regime relies on its prolonged stay in the codification and abstraction sphere of the I-space. Delaying the progression of the knowledge to the diffusion stage of the I-space is in the firms' best interest since rapidly defusing the knowledge eliminates scarcity thus minimising any potential benefits that the firm might realise (Boisot, 1998, pp.96-98).

2.2.3.6 Schumpeterian (S) learning

The notion of S-learning is premised on the hypothesis that the world is non-linear, therefore solutions on how phenomena are handled are also non-linear and inherently riddled with errors. Consequently, no amount of codifying, abstraction and diffusion of data can eliminate all the errors in our understanding of phenomena. As such, prior acts of codification, abstraction and diffusion are always hypotheses about the world or phenomena hence subject to review. S-learning moves data along Boisot's I-space in a continuous and infinite cyclical motion, thus constantly creating new knowledge which destroys existing practices. Contrary to N-learning, which derives greater value by remaining in the coded and abstract spheres of the I-space or region C of the Social Learning Cycle (SLC), S-learning does not reach the state of inertia (Boisot, 1998, p. 59).

1 ◯ Scanning   4 ◯ Diffusion

2 ◯ Problem-solving   5 ◯ Absorption

3 ◯ Abstraction   6 ◯ Impacting
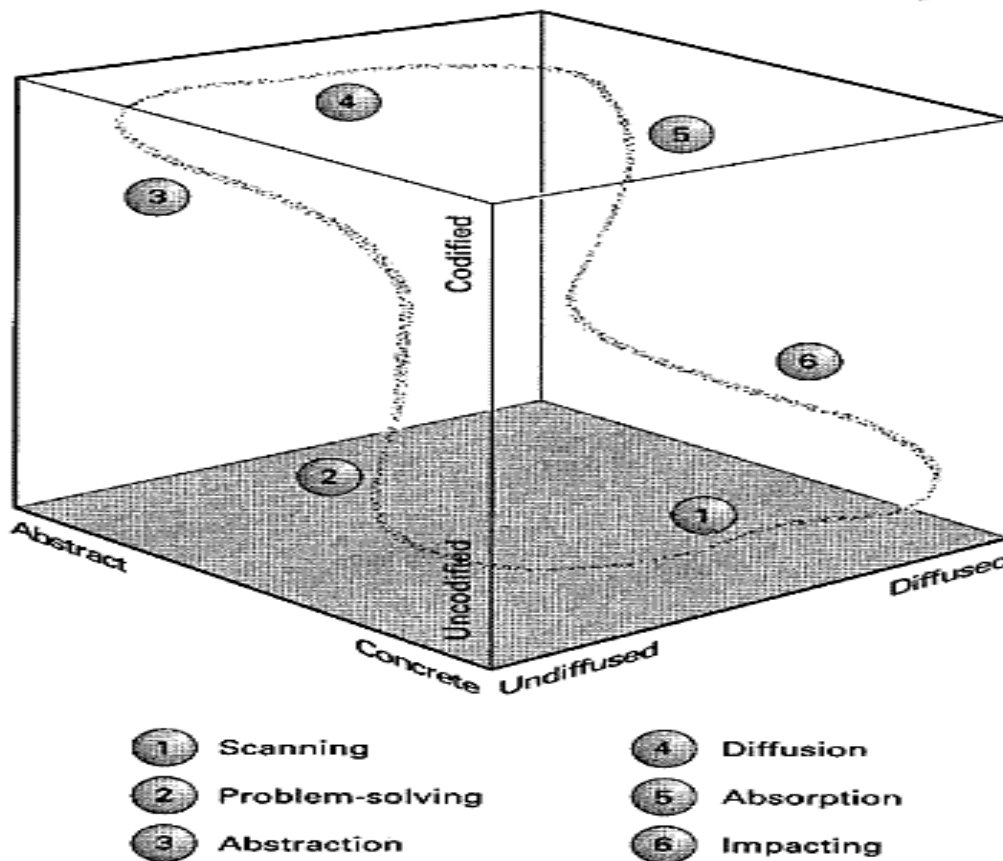
Figure 3: The Social Learning Cycle

Source**:** Boisot (1998)

Once diffused to the population, agents subject the knowledge to their own subjective interpretative schemes which vary according to their experiences. The agents' experiences either confirm or challenge the codes and abstract structures employed in the knowledge. If the codes confirm their existing schemes, the knowledge may be accepted and retained, however, if they contradict the agents' schemes they are most likely to be modified until they conform (Boisot, 1998, pp.99-103).

S-learning is tantamount to innovation, perpetual knowledge creation and the attainment of competitive advantage on a continuous basis, hence a prominent feature of the knowledge economy.

2.3   Knowledge creation, and the knowledge creating firm

Knowledge creation is according to Newell et al. (2009, p. 233) one of four knowledge development processes. It is undertaken for the purpose of forming new ideas, processes, services or products and often results in innovation. The other three knowledge development processes are sharing, codifying and integration.

Similar to innovation, knowledge creation involves many different processes such as experimentation, discussions and research through teamwork or projects (Newell et al. 2009, p.234). Although there are many knowledge creation approaches, *"formal research remains a cornerstone for knowledge production in many sectors, mainly due to its ability to provide a sheltered domain for carrying experiments which are not viable in real life"* (OECD, 2004,22). However, the advent of information and communication technologies (ICT) has opened many new possibilities for knowledge production and development such as online learning which allows individuals to learn by doing and assess their skills.

Depending on the strategic significance of knowledge to the firm, specific knowledge processes are preferred and an environment that allows such to thrive is created. In broad terms, companies seek to explore, exploit, or combine both in their knowledge management approach. Typically, knowledge exploring firms rely mainly on the creation and integration of new knowledge and the knowledge developed by expert workers over time. The outcomes herein are often intangible knowledge based products emanating from loosely defined problem based team designs.

Firms inclined to mostly engage in knowledge creation activities are often small and entrepreneurially driven with an inclination towards radical innovation rather than incremental ones (Newell et al., 2009, p.232). On the contrary, knowledge exploiting firms are mainly interested in improving efficiency and identifying new markets. This is mainly because these firms are often well established and offer recognised services to a captive market. Typically, these include public regulators who are creatures of statutes and not driven by competition and market forces like their counterparts in the private sector.

Cankar & Petkovsek (2013, p.1597) classify drivers of knowledge creation and innovation into internal and external factors. Internally these include the organisation's innovation strategy, culture, size, educational level and skills of staff, the type of resources processed and management's attitude towards innovation. External factors on the other hand, include the prevailing economic conditions, legislation, market growth of the applicable industry, input prices and links with academic and research institutions. In light of the innovation factors, organisations must first improve their internal processes, qualifications of their employees and develop suitable technical infrastructures for sophisticated products.

Usually, knowledge creation inclined firms were typically in the private sector. However, this is no longer the case since the public sector has seemingly begun to embrace innovation to improve its performance (Cankar & Petkovsek, (2013, p.1603).

2.4   Public, private sector knowledge development and innovation

Most KM research has been carried out in the private sector with limited focus on the public sector. KM research on public regulators is even harder to find. Even the works of early KM pioneers such as Nonaka (1991), Nonaka & Takeuchi (1995), Szulanski (1996), Wiig, (1993) and much later, Armistead & Meakins (2002) and Newell et. al. (2009), are based in private sector contexts. Nonaka's flagship work is based on private sector companies in Japan such as Honda and Canon amongst others, whilst Armistead & Meakings' (2002) work is based on interviews conducted with managers in private industrial companies.

As expected, the KM examples, recommendations and theories are premised in the private sector context. Tacitly, this implies that public sector organisations must emulate knowledge management practices that have proved successful and entrenched in the private sector. However, this tendency is not unique to the KM discipline. Throughout history, the public sector always adopted management practices that have already gained recognition and acceptance in the private sector (Cong & Pandya, 2003, pp. 25-31).

Examples in this regard include blockbuster management practices such as enterprise resources planning (ERP), business process re-engineering (BPR), total quality management (TQM), lean production and just in time (JIT). Since it has passed the "fad" stage and accepted as a proper management practice, KM is one of the latest of management practices to be adopted by the public sector (Cong & Pandya, 2003, p.25).

Although many of these practices were initially piloted in the private sector, they were found equally applicable to the public sector. However, there are significant differences between the private and public sector which could determine the success or failure of a KM intervention. Most notable of such is that, firms in the private sector are dependant and answerable to their 'shareholders' whilst the public-sector accounts to stakeholders (Cong & Pandya, 2003, p.28). As such, stakeholders and shareholders must be managed differently due to their differing interests. In comparison, shareholders are mainly interested in returns on investment and thrive on competition, whilst stakeholders are more concerned about issues of policy making, service delivery and provisioning of information.

Considering these distinctions, different approaches to KM must be applied. Therefore, the KM practices with origins from the private sector inevitably require adaptation to the contextual prescripts of the public sector. The same applies to the private sector in case of KM or any other discoveries made in the public sector. In the case of the public sector, adopting KM practices that are already entrenched in the private sector presents a significant disadvantage in that, it always remains at least several steps behind the private sector in terms new knowledge assets. These disadvantages are further compounded in the case of public regulators who are often required to evaluate, adjudicate and monitor knowledge assets for which they may not be ready. Hence, the stereotypes that public institutions in general and regulators in particular are incompetent are perpetuated.

On the other side of this, the diffusion of new knowledge assets or processes may be delayed unnecessarily due to the public regulators being unfamiliar with the products being presented by the private sector licensees, thereby slowing the diffusion process and frustrating the latter's ambitions. For these reasons, the disproportionate research between private and public sector specific KM practices in favour of the former can be a significant constraint to fully embracing and exploiting the benefits of the knowledge economy.

2.5   Knowledge development, and products pending approval

The processes of knowledge development as per Newell et al. (2009) involves, testing, research and experimentation whereby tacit and explicit knowledge are applied in projects and teams. Knowledge development in firms mainly depends on its workers, their qualifications and attitudes. But to a greater degree it also depends on outside factors comprised of other firms, the availability of infrastructure, educational institutions, and regulatory agencies amongst many others (OECD; 2000, p.163). The interdependence aspect of knowledge development and innovation in firms receives support from many authors on the subject such as (Freeman,1987; Lundvall, 1992 & Nelson, 1993) who all note that knowledge creation and development, thus innovation do not occur in isolation but within a system comprised of relationships, and networks. Therefore, the process will inevitably be multi-faceted and multi-directional with many inputs and feedback loops.

Although knowledge creation and development often relies on experimentation, testing and research (Newell, 2009, pp.189 & 234), this does not necessarily mean greenfield scientific R&D. Advances in sciences *take too long to have an impact on innovation",* hence new innovations often do not involve new research *"but a particular application of a known*

scientific discovery or technical development, or a substantial improvement of an existing product or process" (Nelson & Rosenberg, 1993).

2.6   The relationship of regulation and innovation

The relationship of regulation – therefore that of the regulators, and innovation – hence knowledge creation and development, is complex and has been to date not been unequivocally defined. There are strong and valid views supporting regulation as a conduit for innovation. Similarly, there are equally strong views lamenting regulation as an inhibitor for knowledge development for innovation. In the main, the studies of the relationship between these variables have been biased towards exploring the impact of regulation on innovation, however, not much has been done to assess how innovation affects regulation.

Glaeser & Sheifler, (2003, p.401) note that regulation as a system of managing market and firm behaviour gained prominence between 1887 and 1917. At the time, it was viewed as an alternative to private litigation which was the main method of regulating behaviour and resolving disputes. Before the 1900's, it was common for courts to rule on issues such as anti-competitive behaviour, safety of food and drugs, prices and antitrust policies. These issues now pervasively fall under the scope of regulation and regulators (Glaeser & Sheifler, 2003, p.401).

Regulation mainly re-established itself as an important focus of socio-legal research in the early 1980's when several studies were conducted on regulatory enforcement. Such studies are believed to have been spurred by the inadequacies of the then pervasive traditional command-and-control approaches to regulation. Therefore, subsequent studies considered various other aspects to it, such as the economic and political conditions under which compliance with regulatory requirements can be achieved (Haines, 1997, p.269).

Prominent in the study of the relationship between innovation and regulation, thus the relationship of innovators and regulators, are CET theoretical analyses and the Porter Hypothesis. In broad terms, CET theory views regulation as an impediment to regulation mainly due to various inefficiencies attributed to the practice (Schiller, 2008, pp.555 – 598). Whereas the Porter Hypothesis stands in sharp contrast to the views espoused in CET and largely posits that regulation, if applied correctly and under favourable circumstances – in fact, induces innovation rather than stifle it, as argued by economic theory (Stewart, 2010, p.8; Ashford and Hall, 2011, p.270 - 289). Whilst several types and methods of innovation are advanced henceforth, they mainly subscribe to either the CET analysis of the relationship, or the Porter school of thought.

There is a pervasive view that regulation around the world is ubiquitously on the rise due to the failure or inefficiencies of judges and traditional court systems. Andrei Shleifer and others (2003; 2005;2007 & 2012), through various collaborative works, has attempted to explain the supposed rise of regulation with both empirical and historical evidence (see, Shleifer, 2012, p.343; Glaeser & Shleifer, 2003; Mulligan & Shleifer, 2005, and Gennaioli & Shleifer, 2007). Henceforth, deregulation through its various forms, such as the reduction of bureaucracy associated with implementing a particular policy or the removal of specific restrictions, has become an important political and policy consideration (Menez, 2013, p.578).

In reviewing the available literature on the relationship between knowledge development, creation and hence innovation, the extent of the complexity of the relationship is unveiled. The complexity hereof stems from the diversity of the regulations, the industries being regulated, and the types of innovation. Therefore, in examining it scholarly work has tended to be case, industry specific, and examined in detail focused and specified regulatory-innovation issues affecting the targeted industry (Davies, 1983, pp. 42-43). As such, the studies tend to yield bespoke findings and conclusions, but do not provide an abstractive consensus on whether regulation inspires, or smothers innovation.

Stewart (2010, p. 1) in his cross-industry literature review of the impact of regulation on innovation, traces the debate on regulation and innovation in the United States to the early 1960s in the context of the *"decline of economic regulation and the rise in social welfare regulation"*. He notes that the gradual abandoning of economic regulation in favour of social welfare regulation was fuelled mainly by CET theory which views regulation as a significant cost burden on firms that saps resources from the firms' investments on innovation. Stewart (2010, p.1) relied on Joseph Schumpeter's (1942) definition of innovation which distinguished innovation as *"a commercially successful application of an idea – from invention, idea development, and from diffusion"*.

From Schumpeter's definition, Stewart (2010) proffered different forms of innovation, and hence theorised on the conditions under which it is supported, or inhibited, by regulation. Stewart's (2010) study was across various industries and provided empirical evidence from of the phenomenon from multiple perspectives. Therefore, it attempted to provide the uncommon abstract view of the regulation-innovation phenomenon. His study therefore provides a firm foundation to analyse the role of regulators and regulation in innovation.

Prior to Stewart (2010), the regulation-innovation phenomenon as an abstract concept was sparsely and sporadically explored by e.g. Ashford, Ayers & Stone (1985), where the authors

explored the use of regulation to change the market for innovation. Ashford et al. (1985, p.423) provided a model for regulation induced technological innovation and suggested a regulation design that affects technological innovation. This model was adapted from erstwhile models that originated from specific industries such as chemical, pharmaceutical and automobiles.

Notably, whilst Ashford et al's (1985) model was somewhat abstractive, it focused mainly on technological innovations hence deficient in other forms of innovation. Stewart's (2010) work gleans some insights from Ashford et al's. (1985) propositions to form the discussions around regulatory stringency and innovation, which is one of the key propositions in the discussions.

From the 85 odd sources cited in Stewart's (2010) work, all but five of the regulation-innovation studies were conducted in specified industries, organisations or under very specific conditions (see Figure 1). In these studies, specific niche issues on the regulation-innovation relationship are examined.

As an example, the works cited in Stewart (2010), such as Aerni (2004), focused on issues of "risk, regulation and innovation in the case of Aquaculture and Transgenic Fish", whereas the work by Davies (1983) studied the "Effects of Federal Regulation in the Chemical Industry", and Ollinger and Fernandez-Cornejo (1998) focused on innovation in the Pesticide industry. Aquaculture, Chemicals, and Pesticides have very specialised, specific and technical regulation-innovation considerations that cannot be readily applied in other industries such as railways or financial markets, for example. That notwithstanding, abstraction may well be possible from the innovation-regulation concepts gleaned from the narrow studies, an example being either management's response to the introduction or a change in regulation.
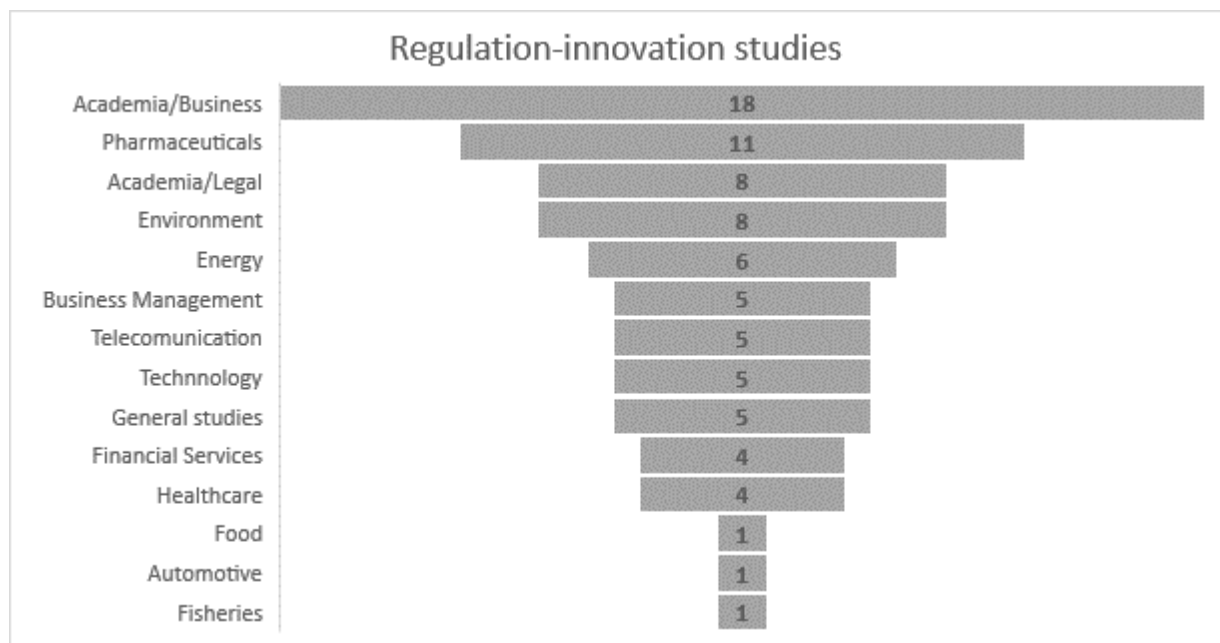
Figure 4: Innovation-regulation studies based on Stewart (2010)

Source**:** Stewart (2010)

From these observations, it appears from literature that specific industry-firm-issue contexts are germane to conclusions about the regulation-innovation relationship. In essence, industry, firm and socio-political-technical contexts cannot be ignored in the study of the regulation-innovation phenomenon. Therefore, if still at all necessary, generic and abstractive conclusions can only be arrived at after gleaning and considering the specific innovation-regulation issues affecting the relevant industries.

Ashford & Hall (2011, p. 279) advance three important contextual conditions that must prevail for regulation to support innovation i.e. willingness, opportunity/motivation and capability to innovate. Accordingly, Ashford & Hall (2011) posit that these factors are interrelated, hence affect each other. The presence of a willingness, opportunity and capability in the context must be on both sides i.e. the regulator and the regulated firms. The centricity of context in regulation-innovation analysis could be the reason generic studies of the phenomenon with no specific industry or situation tentacles are less common compared to the industry-firm-issue driven studies.

The pervasive theoretical constructs that underpin the regulation-innovation phenomenon due to the abstractness of the arguments advanced therein are the CET Theory and the Porter Hypothesis. CET stands out as the main antagonist of regulation induced innovation, whilst the Porter Hypothesis highlights latent innovation possibilities that can be brought forth by regulations.

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2.7   The costs of regulation on innovation from a CET perspective

Regulation is also commonly viewed as costly to innovation mainly due to the proposition that the resources spent on regulation would have been spent on innovation in the absence of regulation. The identification, analysis and extent of the costs is mainly in the domain of CET theory (e.g. Schiller, 2008) and not so much in the Porter Hypothesis.

Porter theorises mainly on how regulation induces innovation, but falls short in stating the costs thereof. Contrarily, Schiller (2008, p.553) nuances the cost burdens proposed by CET theory further and codifies them in distinct categories, i.e. administrative, compliance and efficiency costs. By implication, regulatory cost burdens are viewed as opportunity costs to innovation, as well as knowledge creation and development. Schiller's (2008) primary thesis herein is that in the absence of the burden of regulation, firms will invest more on the exploration and exploitation of new knowledge, hence innovate. The proposition further posits that even in case where regulation achieves perfect outcomes, the costs of achieving these may outweigh the benefits. The principle therefore is that the marginal benefit of regulation must in comparison exceed its marginal costs. If this is not the case, regulation is not a desirable option even if it were to improve market outcomes in the short run.

Regarding the administrative costs of regulation, Schiller (2008, p.556) describes them as the costs of information required by a regulatory body for it determine the "shape and position of the demand and cost curves". Such information, according to Schiller, allows it to make precise decisions and issue directives on the key regulatory variables, typically the structure, behaviour, prices and entry. In all likelihood, Schiller (2008) posits that such information must be regularly gathered, processed and analysed by a myriad of subject matter experts (Menez, 2013: p.578).

Unlike the administrative costs which are primarily borne by the regulatory agencies, compliance costs are mainly applicable to the regulated firm, usually in the private sector. For the regulated firm, the introduction of new regulations will most likely require adaptations of, and, or additions into current practices and process. These come at a cost. In some cases, new regulations mean the complete abandonment of existing business models and practices.

The efficiency costs are a function of a change in consumer tastes and the emergence of modern technologies which inevitably cause changes in the cost structures and cost curves. The market and regulatory cost consideration in this regard, is the ability of the regulatory agencies to change their practices, processes and laws in alignment or in anticipation of the changes in the market environment.

The thesis of efficiency costs posits that if regulators, and regulation, fail to adapt proportionately with the changes in the market, the regulators may impede on new production techniques, marketing approaches and modern technology. The impact of the efficiency costs of regulation are likely felt by both the regulated firms and the regulatory agencies. For the regulator and regulation to stay relevant and to justify its continued presence, it must create the necessary agility to align with the changes brought by technology and changes in consumer taste. Again, this requires resources for knowledge exploration and exploitation endeavours.

CET analysis of regulation and innovation gives impetus to the push for deregulation of various industries. Aggregately, this analysis concludes that regulation increases production costs, diverts resources from R&D, and consequently hinders innovation (Ashford & Hall, 2011, p. 276).

2.8   The Porter Hypothesis, and innovation dimensions of regulation

The first real challenge to the claims by CET analysis that regulation increases production costs, diverts resources from R&D and thus hinders knowledge development hence innovation is credited to the Massachusetts Institute of Technology (MIT) in the late 1970s. The MIT, commenting particularly on environmental innovation, supported the view that properly formulated regulation and regulations, can transform products and processes and confer health and economic benefits (Ashford & Hall, 2011, p. 276). This view was widely popularised and supported by the advent of the Porter Hypothesis in 1991 which provided an aggressive dissenting view to the CET theory. Virtually all economists until 1991 were generally of the view that regulation, especially environmental regulation, restricted their scope and thus reduced their options.

Porter (1991) as cited in Ashford & Hall (2011, pp. 276 – 278) and in Stewart (2010, p.8), essentially posited that regulation, thus regulators, induce rather than hinder innovation, hence the creation and development of knowledge. The Porter Hypothesis holds that regulations can create conditions favourable to new entrants into the market, thereby resulting in the inflow and emergence of different production techniques and processes. As they become aware of new competitors, incumbent firms in the regulated industry feel confronted and are thus spurred to develop new ideas of their own. They thus invest in knowledge exploration and innovation – an investment that would have otherwise not have been made in the absence of regulation (Ashford & Hall; 2011, p.277).

In explaining the Porter Hypothesis in even more detail, Stewart (2010, p.3) proffers three "innovation dimensions of regulation" – i.e. regulatory information, stringency, and flexibility.

According to Stewart (2010), new regulations can change along these three innovation dimensions. On the information dimension, Stewart (2010, p.3) proposes that regulation can promote "more complete information" about the product and processes in the market place. A poignant example illustrating the information dimension of regulation is found in the regulation of product package labels that disclose information about the product, such as ingredients used, quantities, methods of production, expiry dates, side effects and such-like. Such labels reduce information asymmetry in the market, especially on the consumer side. This thus effectively prevents one side of the market from having less information about the products and the market. The mitigation of information asymmetry may also help offset the compliance burden espoused in the classical analysis of the phenomenon and thus reduce the risk of "dud" inventions.

The importance of the information dimension is perhaps highly evident when the regulator and regulation certifies the quality of a product. In this way, Stewart (2010, p.3) notes that the regulator's certification is a compliance value add to the product and by extension to the producer. Mutually, by complying with the regulations set by the regulator, the producer fulfils its compliance expectations whilst the regulator attests and endorses (overtly or tacitly) the producer's product attributes as being of the appropriate quality, safety and integrity. The regulator further endorses the producer overtly, or tacitly, as an upstanding "production citizen". As such, a regulator certified product is likely to fetch a normal or even higher value in the market thus increasing the producer's return on investment.

The stringency dimension of regulation and innovation is according to Ashford et al. (1985, p.426) cited in Stewart (2010, p.4) the principal factor influencing technological innovation. Regulatory stringency refers to the "the degree of change required for compliance innovation" (Stewart, 2010, p.4). When regulatory requirements are highly stringent, a significant amount of change may be required from the firm for it to achieve regulatory compliance thus inexplicably increasing the compliance burden of the firm. As espoused in the CET analysis, an increased compliance burden on the firm is not desirable for innovation. Therefore, from the perspective of the Porter Hypothesis high regulatory stringency does not bode well for regulation induced innovation.

However, highly stringent regulations do not eliminate the possibility for innovation (Ashford & Hall, 2011, p. 276). Contrarily, the Porter Hypothesis views stringent regulations as a possible trigger for innovation and the upgrading and re-engineering of technology (Ashford & Hall, 2011, p. 276). The Porter Hypothesis further notes that companies who innovate despite the compliance burden of stringent regulations gain influence in the industry, are highly valued, but most enticingly, they harvest first mover advantages and capture the market. Also, learning

curve advantages are conferred to such companies for being first and early (Ashford & Hall, 2011, p.276).

The flexibility dimension can be classified into the either "command-and-control" or "incentives based regulations" (Stewart, 2010, p. 5). On the command-and-control side, regulators and regulations take an instructive view of regulation. For example, a firm may be ordered to lower its prices or increase its output. In such cases, regulation induced innovation may be a challenge due to the narrowed scope and limited options about implementation paths. On the other hand, incentives based regulations make particular firm behaviours more profitable to pursue, hence likely to trigger its willingness and motivation to innovate. Firms thus weigh the regulatory incentives embedded in the desired behaviour against the market incentive if it were not to comply.

2.9   Regulatory agencies

Stemming from the inefficiencies highlighted in CET analysis, the regulatory agencies are thus perceived to be generally incompetent at best and corrupt at worst. Hence, it is a commonly held view about public regulators that they rarely succeed in achieving the social welfare objectives which they aspire to and purport to promote (Stewart, 2010: p.1).

Scholarly literature on regulators depicts them as organisations beset with many problems and inefficiencies. Again, this view is rooted in CET analysis. One of such problems, highlighted in literature, is "regulatory capture". This concept, according to Goldcare (2012, p.123), refers to a situation where regulators end up promoting the interests of the industry which they monitor. This they do inadvertently or knowingly to protect the industries or firms which they are meant to regulate.

As Owen and Braeutigam (1978, p. 6) observe, *"one the worst fears of regulatory agencies is the bankruptcy of the firms it supervises since this can cause instability"*. Based on this fear, regulators unwittingly participate in cartels and stifle competition through means such as the strategic use of litigation, information and innovation management.

Regulators are thus prone to industry lobby advances and accept things such as gifts, friendship and even opportunities to socialise since they speak the same language.

"*Lobbying occurs through the forging of close personal contact between the lobbyist and government officials whereby social events are crucial to this process. Accordingly, industry's objective is to establish long term personal relationships transcending any*

issue. Company and industry officials must be party to the agency decision not just organisational functionaries. A regulatory official contemplating a decision must be led to think of its impact in human terms. Officials must be less willing to hurt long time acquaintances than corporations." (Owen and Braeutigam, 1978, p. 6).

Evidently, Owen and Braeutigam's (1978) thesis does not hold regulators in high regard and directly feeds into the deregulation movement's assertions. However, their thesis has somewhat been discredited and derided as a mere "how to manual" for new and established industries, based on the authors' own frustrating experiences in the regulatory game than the actual characterisation of how it typically occurs.

The criticisms of these agencies are echoed amongst others by critics of the concept of social welfare regulation and clear proponents of self-regulation such as, the Chicago School of Law and Economics (see Stigler, 1971; Posner, 1974, Ellickson, 1994; OECD, 2000). In criticism of social welfare regulation, self-regulation champions also support the opportunity cost perspective espoused by CET analysis.

2.10   Chapter conclusions

Broadly, the literature review indicates that KM research has been largely focused in the private sector with very little focus in the public sector. As such, KM practices in the public sector are mainly premised on the findings from the private sector. No KM research conducted in regard to the practices and processes of the regulated gambling industry with a particular focus on the regulatory agencies' knowledge contribution was found. As it is typically the case with the public sector, KM practices of public regulators are largely premised on research in the private sector. Therefore, the KM issues of the public sector and regulators, in particular, are largely unexplored, hence poorly highlighted and under-developed.

With its focus in the public sector and regulators, this thesis occupies this space and aims to address KM issues, particularly knowledge development practices in the public sector using the public regulator as a basis. Furthermore, the literature review of the regulation and knowledge development for innovation phenomenon strongly suggests that a narrow focus and the context where the issues are explored are critical in the analysis. Unsurprisingly, many of the reviewed sources have followed this route. It is also clear that findings about the relationship from specific industries are not always automatically applicable to the next industry being studied. As a result, abstract conclusions about this relationship are always based on a fusion of multiple findings from different industries and firm's situations.

Although CET explains the cost of regulation on innovation, and largely classifies these in terms of efficiency, administrative and compliance costs based on the industry context sensitivity of the subject, there may well be many other costs which are not yet highlighted by the literature. Probably the catalogue of costs presented in the literature can never be exhaustive, hence there is always scope to uncover and highlight more of such costs. For example, the costs associated with culture is an obvious omission in the study of the regulation and knowledge development for innovation phenomenon. It may well be that certain cultural contexts are tolerant to volatility and high rate of change, hence likely to embrace regulation induced knowledge development and innovation. Whereas in other cultures, stability and predictability may be more desirable, hence such an environment will be more tolerant to regulation that seeks to enforce and maintain the status quo.

Still maintaining the importance of context in the study of the phenomenon, it follows that regulation and knowledge development for innovation issues will differ from region to region, country to country, and continent to continent. Therefore, variables and combinations of the phenomenon are infinite, thus always leaving scope to study the subject much further.

In light of the available literature, and more particularly the literature reviewed herein, it appears that the studies in this area are still in their infancy. As such, there is vast scope to explore the subject from many possible dimensions.

In this regard, I have opted to pursue it from the perspective of the regulatory agencies due to their centrality in the regulation space. More abstractly, my focus is on how regulators impact knowledge development, hence innovation. The literature review in this respect shows that this perspective and context of knowledge development are largely unexplored.

The main account of regulators towards knowledge development and innovation is mainly negative and stereotypically explained through the lens of CET. Hence, regulators are generally not held in high regard and seen as inhibitors of innovation. Whilst the Porter Hypothesis attests through empirical evidence that regulation bears properties of knowledge development for innovation, the available literature does not address the role of the regulators in the innovation processes. This is a highly notable omission since the regulators are the implementers and custodians of the regulations.

It is noted from the Porter Hypothesis that regulation – the *process*, and not the regulators – the *processors* is hailed as a potential knowledge development and innovation driver. However, the literature seems oblivious to the efficacy of the *processors* in the *process*. Instead the view that regulators are not good for innovation still holds firm and continues to be perpetuated. That

notwithstanding, this posture is perhaps justified by the fact that the Porter Hypothesis is a recent theoretical construct that is based on empirical evidence of the study of the phenomenon. Thus far, not many empirical studies have been conducted to understand regulators as contributors to knowledge development for innovation.

This thesis desires to contribute to this discourse by empirically highlighting the knowledge development for innovation from the perspective of regulators, rather than the regulation itself. Since context and specificity have proven based on the literature review to be central in such studies, this thesis focuses in the regulated gambling industry context in South Africa. Since regulated gambling in South Africa is very broad and diverse, the study will focus on a gambling product that has, and continues to be, a source of controversial debates in that industry, which is the EBT.

Chapter 3 – Empirical perspective of regulation: a gambling industry consideration

3.1   Introduction

In the scheme of the literature review in Chapter 2, and the generic prescripts for knowledge development for innovation, questions arise as to which direction the gambling industry aligns itself. As such, its configuration and organisation of relationships are considered to determine inclination towards either CET or the Porter Hypothesis. Furthermore, do these collaborations and alliances favour a knowledge development contribution towards innovation of products such as the EBTs whilst in the diffusion process? In light of these considerations, this chapter outlines and explains the relationships, alliances and collaborative networks of the industry and the various key stakeholders. These relationships are later viewed through the lens of knowledge development and innovation to illuminate the contribution of the regulator in this respect.

3.2   Overview of the regulated South African Gaming Industry

Gambling and its regulation is a business of information and knowledge. Behind the leisure, entertainment and social aspects of gambling and its regulation lies a foundation built on solid information, or knowledge. The games played are premised on highly complex mathematical and probability theoretical concepts, whilst the systems and technological artefacts to monitor these are based on very complex algorithms and designs. Yet the shelf life of such products is very short thus requiring constant knowledge creation and innovation. In general, and as a system, gambling is a dynamic industry wherein organisation's survival requires constant generation and application of new knowledge to yield innovation. To illustrate, the nine provinces of South Africa approve approximately 3000 new gambling products and conduct an average of 1500 changes on the gambling floors each per annum (MGB, 2015).

The industry is also grappling with many diverse issues which thus demand the continuous application of all knowledge processes of creation, integration, sharing and application. At a policy level legislators and regulators are considering whether to license more forms of gambling, for example, dog racing, whether to increase the stakes and prizes in the Limited Payout Machine (LPM) sector, how to best regulate EBTs and how to tackle illegal gambling

(GRC, 2015, pp. 11- 13). Whilst the incumbent operators must consider and contend with the new competitors who are entering the market, already at an advantageous position due to their technologies and reduced barriers. At the same time, they must gradually embrace and incorporate the new technologies without interrupting their existing operations. Manufacturers, on the other hand, must consider feedback from the operators and ensure the delivery of products that will be acceptable to the market and profitable. All this must be done in the context of ever changing legislative requirements which must be adhered to.

For such reasons, it is apparent that those in the industry who create new knowledge quickly and frequently are able to embed such knowledge into artefacts and processes that are diffused and acceptable to the end users, will enjoy much sustained competitive advantage and likely to thrive.

Apart from horse racing and sports betting, before 1996 most other forms of gambling were prohibited, therefore illegal in South Africa. The Gambling Act of 1965 was the central legislation and outlawed almost any kind of gambling in the country. However, the advent of the erstwhile Bantustans within the borders of South Africa in 1976 allowed the independent homelands of Transkei, Bophuthatswana, Venda and Ciskei (TBVC) to introduce their own gambling legislation (NGB, 2010). This resulted in the legalisation of casinos and lotteries gambling within the independent states.

The dawn of the new Constitution of the Republic of South Africa in 1993 ("the Constitution") allowed for the re-incorporation of the independent states into South Africa and further permitted gambling license holders from the TBVC states to legally conduct gambling under the new dispensation.

For the rest of South Africa, it was only in 1996 that many other varieties of gambling were legalised after the findings and recommendations of the Wiehahn Commission of 1995 ("the Commission"). In the main, the Commission recommended the general legalisation of gambling, but subject to strict control. It envisaged that legalisation will amongst other things ensure the integrity and fairness of gambling and protect the players from overstimulation of its latent demand. Furthermore, it was expected that the industry will be a significant source of revenue and employment which augurs well for economic growth and development of the country (Wiehahn Commission, 1995).

Since the Constitution recognised the competency of the provincial governments to legislate on several issues, including gambling, the National Government promulgated the National Gambling Act of 1996 which provided for concurrent jurisdiction on gambling matters. All nine provincial governments swiftly activated the provisions of the National Gambling Act that allowed them to license and legislate on functional areas of casinos and other forms of gambling. As such, the first legal casino was opened in the Mpumalanga Province in the latter parts of 1997 with many others following suite from 1998 onwards (NGB, 2010).

3.3   Growth of the industry and emergent challenges

Since the implementation of the legislative framework, the gambling industry has seen rapid growth and development (GRC, 2010). Although the Wiehahn Commission only envisaged five forms of gambling modes i.e. lottery, sport pools, casinos, Bingo and betting (Wiehahn Commission, 1995, p.114), various new modes have since emerged mainly through technological advancements.

For instance, the LPM sector, which is modelled around casino slot machines but at a much lower scale to target lower ends of the market, or EBTs, which fuse traditional Bingo and casino slots gaming into a single offering. Like the original casino formats, the LPM and EBTs have developed and formed into independent self-sustaining gambling sectors. There are indications that even more modes of gambling may be introduced in light of ongoing discussions and arguments for online gambling, or dog racing amongst others.

However, as the industry grew, challenges have also emerged particularly due to the technological advancements and the persistence of sophisticated forms of illegal gambling activities, such as interactive gambling. Whilst technology has presented significant opportunities which were rightly exploited by the industry, it has also created the problem of proliferation and may have overstimulated the latent demand for gambling. In this regard, technologies such as the internet and mobile devices have blurred the lines of regulation and diluted existent definitions of the forms of gambling that are permissible in law (GRC Report, 2010, p.183). These new forms of gambling have increased competition and threatened existing forms of gambling such as casinos who have built their business models on older fixed forms of technology that are difficult and costly to replace.

Also, in some cases the entry barriers have been significantly lowered, for example, previous legislative requirements demanded prospective licensees to have security of tenure on the land where they built, graded hotels with predetermined number of rooms, conference, and

convention centres amongst others. Whereas current applicants such as in Bingo operators are only required to create jobs and provide evidence of economic and community benefits (CASA, 2015, p.15).

Therefore, new entrants are able to enter the industry with lower capital investments and incur a fraction of the operational costs. This has led to much consternation in the industry especially from the existing operators who no longer feel protected by the gambling legislation and policy makers.

3.4 Industry composition and relationships

In broad terms, the gambling industry is comprised of legislators responsible for promulgating the laws of regulation and these include the National and Provincial Governments. At the second level is the regulators that are responsible for advising the legislators and the implementation of the regulations. At the third level is the manufactures and operators who design, manufacture, and distribute the product. At the last level are the operators such as casinos and LPM sites who operate gambling products and interface with the end users.
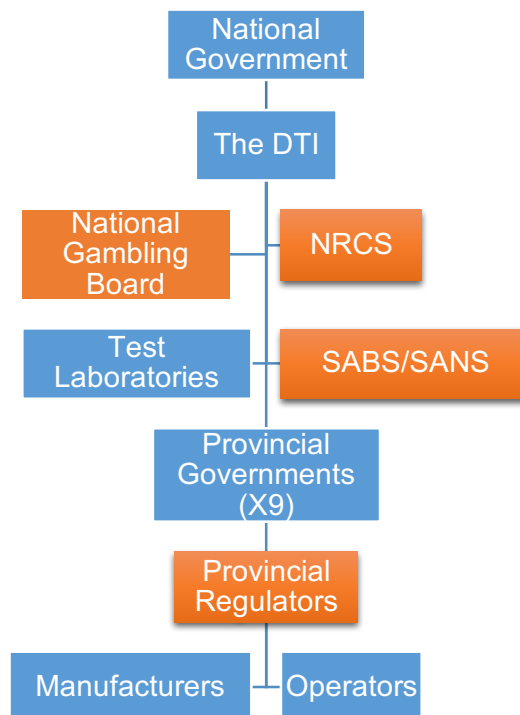
Figure 5:   Relationships and interactions in the gambling industry

Source: Personal collection

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The relationships in this regard characterise high diversity, complex interdependence, dynamism, with many centres and sources of knowledge. It is comprised of manufacturers, operators and regulators, and congregates diverse skills and professionals, from engineers and designers to lawyers and accountants. The subdivision, or categorising, of licences into different sectors such as casinos, Bingo, LPMs and Horseracing entrenches the diversity and complexity even further.

The different sectors of the industry also use varying types of technological artefacts, games and product which are themselves products of knowledge creation and innovation. Albeit for different purposes, all the participants generate and consume knowledge in pursuit of different strategic purposes, broadly exploration, exploitation or a combination of the two.

Although the participants are competitors with different interests, they are brought together by legislation which requires and fosters collaboration and inter-reliance amongst them. As an example, manufacturers are proscribed from operating, whilst operators do not manufacturer the products. To cross the divide between operating and manufacturing, the participant must obtain the appropriate license which will classify and restrict them accordingly. That notwithstanding, the products from the various manufacturers must be compatible with each other. For example, manufacturers of central monitoring systems (CMS) must ensure that their systems communicate effectively with gambling machines manufactured by a different manufacturer. Conversely, the manufacturer of the machines and games must design them such that they are compatible with the monitoring system from another company.

The interoperability requirements imposed on the manufacturers allow the operators to harmoniously offer a diverse range of products on their floors whilst also satisfying the requirements imposed by the regulator. Intrinsically, for product manufacturers to exist there must be operators who have the wherewithal and willingness to offer the products. All of this must occur under the watchful eye of a duly appointed regulator. Therefore, the knowledge creation ingredient of collaboration and self-managed project based teams (Newell et al., 2009, p.234) must, by law, be always available for the industry to exist.

Factor	Regulators		Firms in industry	
	Legislators	**Regulators**	**Manufacturers**	**Operators**
Composition	° 1 National ° 9 Provincial	° 1 National ° 9 Provincial ° Technical Standards	12 nationally licensed	° Casinos ° Bookmaking ° Bingo ° LPM Sites
Role	Legislative & policy making	Advise, research & implement legislation & policy	Design, manufacturing & distribution (product/concept owners)	Operations Sales Public interface
Interactions	National & Provincial Regulators	Legislators; manufacturers & operators	Regulators & operators.	Manufacturers & Regulators

Table 2: Relationships; Interactions & Roles

Source: Personal collection

3.5   Networked and collaborative innovation in the industry

Given that, the knowledge development process is often a networked multi-directional and multifaceted process; collaboration becomes a compulsory requirement. Furthermore, given that the newly created knowledge will almost always be premised on pre-existing ideas hence a "re-packaging" and "re-incarnation" of erstwhile ideas, it is inevitable that other people will, and must, contribute to the product.

For example, in cases of legally protected products through copyrights, trademarks patents and suchlike, the "next innovating" company must request and obtain permission and documentations from the owners of the base product. As such, by extension, the qualifications and attitudes of these external firms towards knowledge development and innovation becomes critical to the diffusion of the new products (OECD, 2000, p.163).

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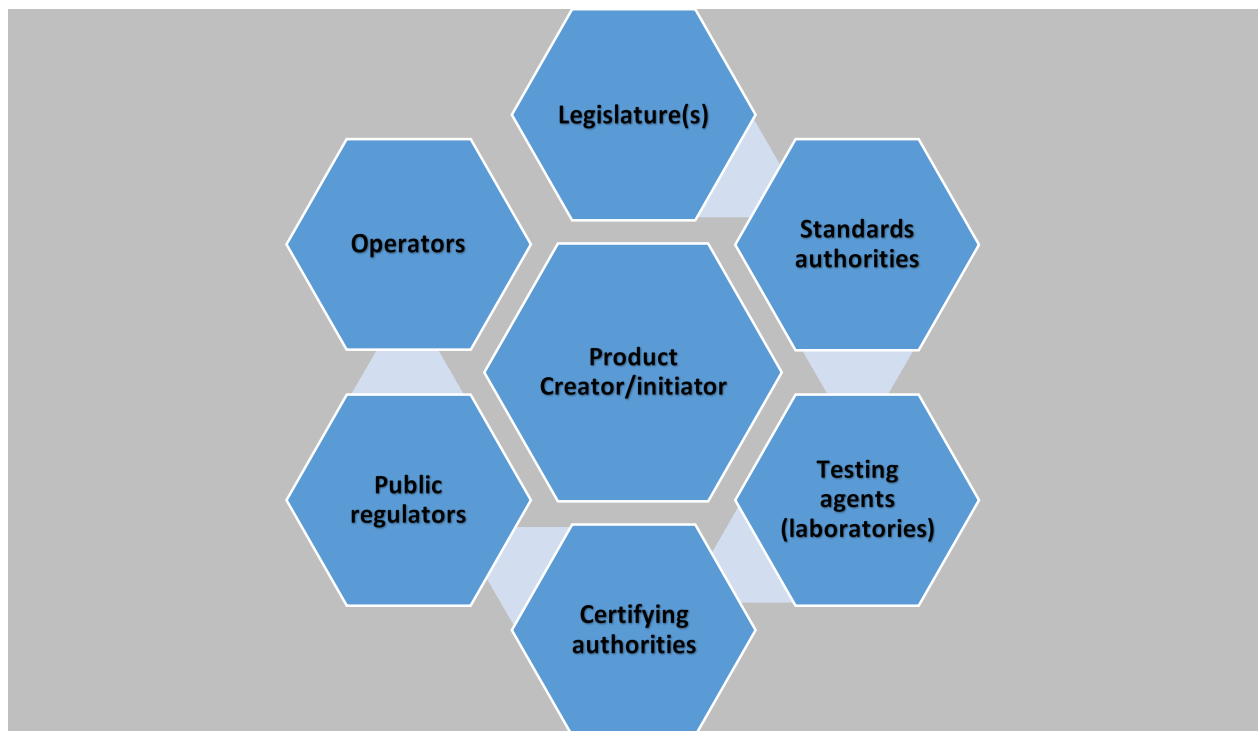
Figure 6: Gambling industry knowledge development & innovation network

Source: Personal collection

Whilst the next innovating firm will for purposes of speed, competitive advantage and profit rather not involve too many external participants in the process, the innovation system demands their involvement. In case of the gambling industry and the model product under consideration, for it to succeed as a knowledge product, the prevailing "innovation system", contemplated by Lundvall (1992) and others, demanded the presence of the following collaborative elements:

i) **A legislative framework:** This is created by the various spheres of government. Since gambling is a regulated competence, innovators ought to be informed of the limitations and expectations regarding products. This thus informs the innovation scope of the initiator, hence the budgets and timelines. Without the legislative framework, the manufacturer may incur unnecessary innovation costs and the product run into diffusion difficulties with authorities.

ii) **A technical testing framework:** Tests on the new products such as EBTs must be conducted by accredited testing laboratories. The tests are conducted in line with accreditations and prescribed technical requirements. For the product creator, this provided assurance that the tests will be thorough, fair and the results thereof will be accurate. This thus provides certainty that if the product passes the test it is more likely to be allowed for diffusion.

iii) **A certification framework:** Confirming the evaluation of the test report and the compliance thereof against the applicable technical standard. This confirms to the submitter that the product is of the expected standard and paves the way for its submission to the relevant regulators.

iv) **Approval by the public regulators:** This is the first stage of the product's diffusion to the end user and it provides assurance to potential operators that the product has gone through the relevant processes. It will perform as claimed in terms of revenue, safety, security, fairness and auditability.

v) **Machine operators:** These are comprised of casinos, Bingo halls and LPM sites, amongst others. An uptake and long-term operation by these operators confirms that the product is of acceptable standards and an endorsement of its features and attributes. Such knowledge may thus be used by the manufacturer as a basis for the development of further products or the creation of other variations of the same product.

Without the knowledge creation and innovation network depicted by Figure 6, the knowledge product from the innovator fails and likely to be shelved and internally appreciated. The view that the various checkpoints as well as the multiple parties in the process of approving new products in the gambling industry as outlined, which essentially refers to the regulation of the industry are an additional barrier to the diffusion of the product, is biased and incomplete (see Shleifer; 2005, p.440). The point that is easy to miss is the various learnings and knowledge contribution into the product by the different institutions.   After all, innovation hence knowledge creation and development do not occur in isolation.

At the point where the manufacturer is satisfied that it has a product that is good enough to solicit a positive test report from the test-laboratory, Schumpeterian learning posits that the innovation is not final but still subject to further knowledge development. At such a point, the innovation is merely a hypothesis of what the completed product may be and thus subject to the interpretive schemes of the various regulatory agencies that must evaluate and approve it (Boisot, 1998). The availability of a tangible and visible functional product exhibits an advanced stage in the research and development process of the product, but does not imply the availability and diffusion-readiness of such.

3.6 Knowledge development contribution by different collaborators

The difference in roles and interests on the product by the various stakeholders involved in the process thus require the companies to ask different knowledge developmental questions about the product. Since the manufacturer as the originator of the product is interested in the product attributes that will set it apart from the competitors its questions and interests will be around features that sets it apart and highlighting the attributes that make it better than the competition. Accordingly, the knowledge gleaned from answering these attribute-related questions is useful in the further development or elimination of undesired attributes of the product.

The test laboratory's role is primarily that of the first external examiner of the product; in that it provides an independent opinion about the product against approved industry standards. Similarly, such knowledge is returned to the originator to consider inclusion or removal from the product. The certifying authority also contains advisory elements in its evaluation since it will inform the originator of the product whether the relevant criteria is met, and as to which jurisdiction(s) the product is likely to satisfy the approval and diffusion requirements. The CA's role is somewhat similar to that of the regulator in terms of the advisory features, however, the latter's questions will always tend to be biased towards public interest considerations.

Operators as the final evaluators of the product are just like the manufacturer interested in the commercial aspects of the product, i.e. whether it will ultimately yield profits. In summary, the process and requirements for diffusion products such as the EBT in the gambling industry develops knowledge from a design (manufacturer), technical (test laboratory), legal and public interest (CA and the Regulator), and a commercial point of view. All the contributors and contributions from these collaborators are outcomes of a knowledge development processes embarked upon by the entities which ultimately provides feedback to the originator and the product itself.

Table 3: Typical questions, feedback, contribution & and actions of collaborators

Element	q1 Manufacturer	q2 Test Lab	q3 Certifying Authority	q4 Regulator	q5 Operator (casinos, LPMs, Bingo etc.)
Typical Questions	° Is it different? ° Will it sell enough($q5$)? ° Is it better? ° Can it be certified ($q3$)/approved ($q4$)?	° Is it safe? ° Does it/will comply ($q3$/$q4$)? ° Will it be certified ($q3$)?	° Does it meet certifying criteria ($q3$)? ° Which jurisdiction is it appropriate ($q4$)?	° Is it safe, fair & accurate(q4)? ° Can it be audited(q4)? ° Will it cause harm(q5)?	° Will the regulator allow it ($q4$)? ° Will my customers like it ($q5$)? ° Is it better than what I have ($q1$)? ° Will it improve my revenue ($q5$)?
Feedback direction	To $q2$, $q3$, $q4$ & $q5$	All to the manufacturer ($q1$)			
Knowledge contribution	"Greenfield"	Technical/advisory	Secondary/advisory	Legal & public interest	Commercial
PO Actions/options	Further research/development	Implement Further research development	Correct non-compliance Further research/dev.	Correct non-compliance Further research/dev.	Improve attributes Further research/dev.

Source: Personal collection

3.7   Analysing knowledge strategies and processes in the gambling industry

3.7.1   Manufacturers and operators

The composition of the regulated gambling industry in South Africa and the relationships between or amongst its participants provides notable examples of knowledge exploring and exploiting firms. It also provides some of the best examples of collaboration to create knowledge assets that yield sustained competitive advantage.

In this respect, industry stakeholders such as manufacturers and operators are more inclined to explore knowledge since their environment requires new products regularly to meet the demands of their often-fickle customers and to counter competition (Newell et al., 2009). The knowledge assets resulting from their activities are often systematically formalised and codified mass-produced artefacts which are manufactured to fine tolerances and little variation.

For example, the slot machines and games used in casinos and elsewhere in the industry must comply with very specific standards and accreditations. Once certified against these, they can be mass produced to the exact specification as certified. Failure to manufacture the machines and design games in accordance with the standards almost certainly results in it being rejected by the regulators thus barring it from diffusion to the end users.

For the manufacturers and operators, the artefacts such as gambling machines and their catalogue of games represents their knowledge assets which they protect through various means such as patents, copyrights, trademarks and encryptions, amongst other forms. But with the understanding that the economic value of these assets is not indefinite (Boisot, 1998, p.3), and that the knowledge base that sustains these assets changes, the firms continuously explore knowledge to sustain the asset's knowledge base and prolong their usefulness.

On average, manufacturers introduce approximately 200 new products per annum in each of the nine provinces where they are licensed whilst the operators change and re-configure the offering at least 900 times per annum (MGB; 2015).

3.7.2 Legislators and regulators

Since gambling is a regulated industry, the implementation of the new knowledge assets is dependent upon the various regulators. They determine the traditional regulation variables of price, entry, timing and innovation (Owen & Breautigam,1978, p.6). In this regard, variables such as the number and type of licences, the number of products and the location of such are legislated nationally and provincially and enforced by the various regulators (GRC, 2010, p.32). Using casino and LPM licenses as examples, it has been determined and legislated nationally that 40 casino licenses can be issued and 50000 LPMs (phase 1) can be licensed (GRC, 2010, pp.57-59).

Unlike the manufacturers and operators, regulators are mostly inclined to favour knowledge exploitation strategies and less concerned about discovery of new knowledge. Within the confines of legislation, regulators typically favour efficiency savings and identification of new markets (Newell et al., 2009, p. 232). As such, their composition and organisation of resources differs in accordance with their strategic knowledge purposes. The differences are such that at the legislator and regulator levels, more formal structures like consulting firms may be prevalent, whilst the manufacturers may tend to be creative oriented and less informal. At the operators' level, it may be more of a Taylorism arrangement (Newell et al., 2009, p.6).

Consistent with the theoretical review and constructs in Chapter one, regulators set the framework and parameters whilst manufacturers aim to create new products within such frameworks and operators implement the discoveries. This is not to say the roles do not overlap within and across the different industry participants.

It is from these strategic knowledge purposes that conflict or synergies emerge, especially when a knowledge exploration leaning firm must collaborate with knowledge exploiting firm(s) for innovation to occur. The collaboration is legislatively induced in the main and not the ideal preference of either parties. Arguments have been made to the extent that this is a toxic relationship and a power struggle tilted in favour of regulators in the statutory sense, and of manufacturers in the innovation-knowledge creation/development sense. Notably because regulators are creatures of statutes and legislated monopolies with very little to no incentive to explore new knowledge for their subsistence, whereas their licensees (manufacturers and operators) in the private sector must explore and develop knowledge for survival.

3.8   Chapter conclusions

Given the processes, relationships and interactions in the gambling industry, the questions whether this network promotes knowledge development by the regulated entities and the regulator, or whether such a network stifles it, can be best answered by empirical evidence. On the surface of the configuration, it appears that there are too many layers of evaluation (e.g. PO, laboratory, CA, Regulator & operators) which may impose an unnecessary cost and compliance burden on the innovator, delaying diffusion of the product thereby inhibiting knowledge development and innovation.

Nevertheless, this will largely depend on which side of the of the innovation spectrum the phenomenon is viewed. Certainly, from the licensee point of view reduced layers of evaluation and diffusion will augur well for the turnover of new and innovative products hence the increase in revenue. From the regulator's point of view, the argument will likely highlight the necessity of these evaluation layers, since each layer is responsible for the development of knowledge about, and for the product which was likely not considered by the preceding layers of evaluation. The type of knowledge about and for the product differs according to the contributor's input as required by legislative prescripts.

Accordingly, the manufacturer provides the basic concept and platform of operation. This is a certain kind of knowledge development following a specific path of development. The laboratories, the CA, the public regulator and the operators all develop different types of

knowledge that eventually improves the product. From their strong public interest perspective, the regulator is likely to favour this configuration of the industry, since it appears to be thorough with sufficient fail-safe measures in place. Notwithstanding the possible views of the regulator and the manufacturer, the posture of this network against either CET or the Porter Hypothesis will become more apparent from empirical observations and analysis in the preceding chapters.

Chapter 4 – Empirical observations

4.1   Introduction

This chapter presents the empirical data collected using the methods described in Chapter 1. The data presented herein is comprised of organisational, semi-structured interviews and product data which was gleaned from documents and interviews. The organisational and interview data provides an overview of the organisation which will later be used to highlight its posture *vis-a-vis* knowledge creation and development. The product data is aimed at highlighting the product before the regulator's involvement, and afterwards.

4.2   Overview of the model regulatory body

The MGB is a provincial public company established in terms of the Mpumalanga Gambling Act 1995, an Act of the provincial legislature from which it derives its powers and mandate. The organisation's main activities are the issuance of gambling licenses and the subsequent inspection of gambling activities, products, regulation of entrants, and facilitation of the growth of the industry. The organisations' activities are therefore informed by the requirements of the founding legislation, the policy prescripts of the provincial government and all other applicable ancillary legislation applicable to companies and public entities in particular.

As at 31 December 2016, the organization had issued and had under its supervision 255 gambling licenses comprised of three casinos, 163 LPM sites, 37 Bookmakers and nine Bingo operations. These licensees operated a total of 3247 different products amongst them. A large portion of the products are casino machines with a total of 1186, followed by LPMs with 777 then Bingo with 1284 (MGB, 2016).

Figure 7: Active gaming products

Source: MGB annual report 2016

51
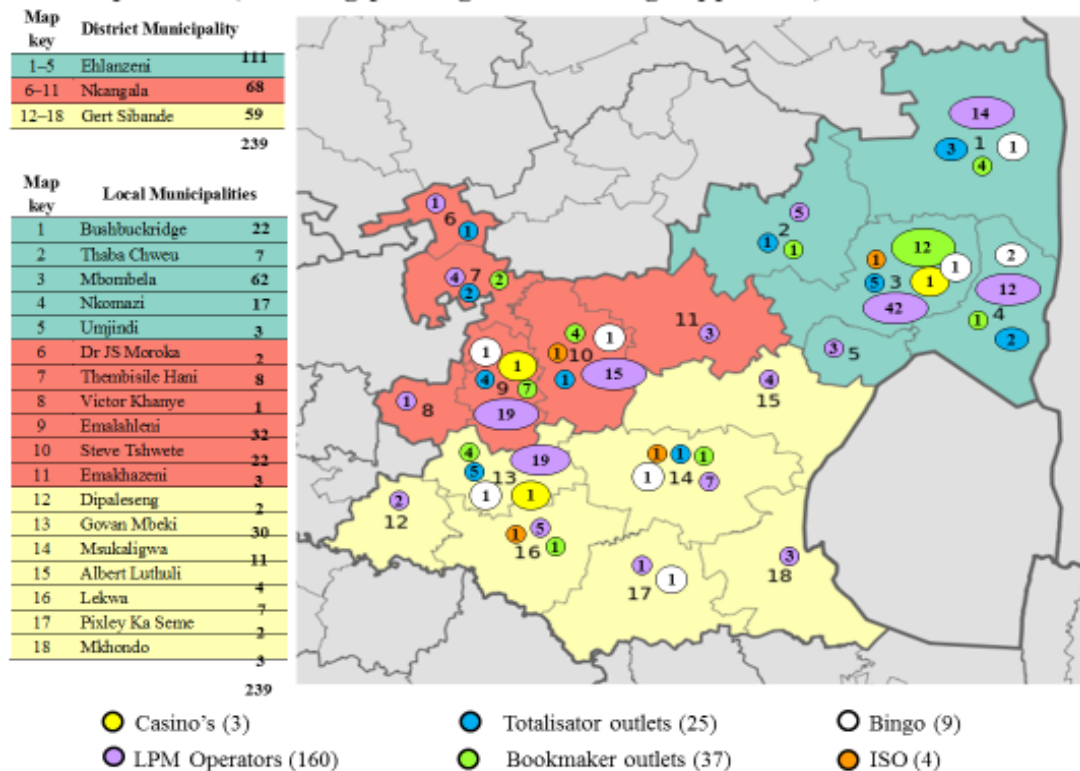
Figure 8: Distribution of licenses in the Mpumalanga Province

Source: MGB operational reports

4.3   Organisation's strategic posture

The organisation's vision is *"to be at the forefront of effective regulation of the gambling industry",* whilst its mission is to ensure the integrity of gambling through efficient regulation of licensed gambling establishments.

4.4   Organisation's objectives

The objectives of the organisation are as follows:

i)   "To perform the functions assigned in terms of the Act;

ii)   To ensure that the regulation of gambling is effective and efficient;

iii) Render support to the Responsible Member on gambling issues and ensure that government's policy on gambling is implemented;

iv)   Co-operate with the National Gambling and other stakeholder on matters of mutual interest; and

v)   Conduct research with a view to advise government on the socio-economic impact of gambling in the province."

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4.5   Organisational structure

The organisational structure is comprised of four layers and the CEO is ultimately the accounting officer. The CEO reports to a Board of directors; and is also an ex-officio member of the Board and all its various sub-committees.

The organisation's activities are subdivided into six different sub-programmes. Three of the programs are responsible for "production" and the other three are support functions. The production programmes are Licensing, Gaming Control, and Audit. All the programmes are managed by executive managers who are automatically members of the organisation's executive management committee, and all report to the CEO.

Below the executive managers are the investigators, etc. The production workers are the first line of contact employees who are mainly responsible for operations managers who are responsible for different operations portfolios e.g. casinos, systems, gathering and processing data under the immediate supervision of the operations managers.
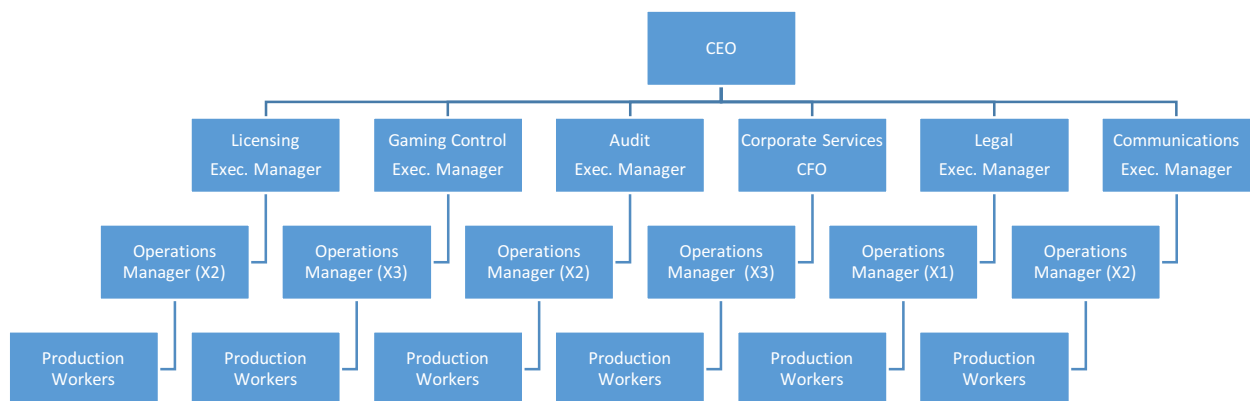
Figure 9: Adapted MGB organogram (2015/2016)
Source: MGB annual report 2016

4.6   Human resources

The MGB's average staff complement from 2012 to 2016 is 55. Most (43%) of the employees are classified as skilled, whilst 26% are qualified professionals, semi-skilled workers at 18% and the rest, i.e. 13% are the executive managers. The skilled workers are mainly the production workers such as investigators, inspectors, and auditors, whilst the qualified workers refer to the

operations managers. The semi-skilled workers are comprised of the assistants such as secretaries, receptionist and messengers (MGB Annual Report; 2012 – 2016).
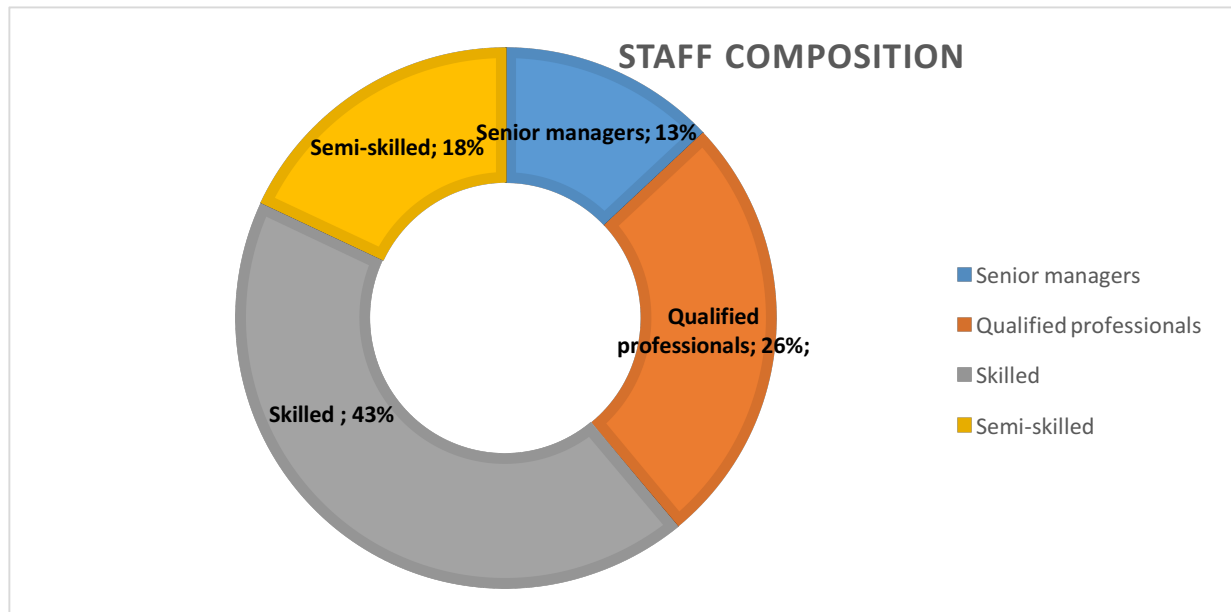
Figure 10: MGB Staff composition

Source: MGB annual report 2016

Table 4: MGB Staff composition

	2012/13	2013/14	2014/15	2015/16	2016/17	Mode
Senior managers	7	7	7	8	7	13%
Professional qualified	12	13	13	13	13	26%
Skilled	23	26	25	27	23	43%
Semi-skilled	13	9	10	10	7	18%
Unskilled	0	0	0	0	0	0%
Total	**55**	**55**	**55**	**58**	**50**	**100%**

Source: MGB annual reports (2012 – 2016)

4.7   Staff training

The purpose of staff training, as the organisation sees it, is to ensure that it stays and keeps abreast of developments within its environment. Training needs are identified annually within the operational departments and are mainly informed by annual performance appraisals. Once the needs are identified, annual organisational training plans are formulated and appropriately funded. Staff training is one of the key performance objectives of the human resources function. Consistently, since the inception of the organisation staff training is included as a key strategic item of the organisation.

4.8   Education policy

As a policy, the organisation provides educational assistance to its staff in the following manner:

i) Full payment of tuition fees, examination fees and for the cost of all books directly to institutions of higher learning.

ii) Study leave comprised of at least five days for exam preparation, study school attendance and research as applicable. Furthermore, employees are allowed at least one day off before each examination date and another day off for each examination.

iii) Employees are required to submit examination results to the employer and are required to pass all their examinations. Where an employee fails a module, they are required to re-imburse the employer the costs of such a module and must fund such a module on their own should they wish to re-register.

iv) Upon completion of a qualification at a registered and recognised higher education institution, employees are rewarded with a bonus payment of 5% of their total annual remuneration package.

v) In the interim, employees are also required to remain in the employ of the organisation for at least one year after completing a qualification funded by the organisation.

	Certificate	Diploma	B. Degree	Honours	Masters	Professional qualification
2012	0	0	0	0	0	0
2013	0	6	4	1	7	0
2014	0	3	5	2	4	0
2015	2	1	5	1	1	1
2016	0	6	4	0	2	2
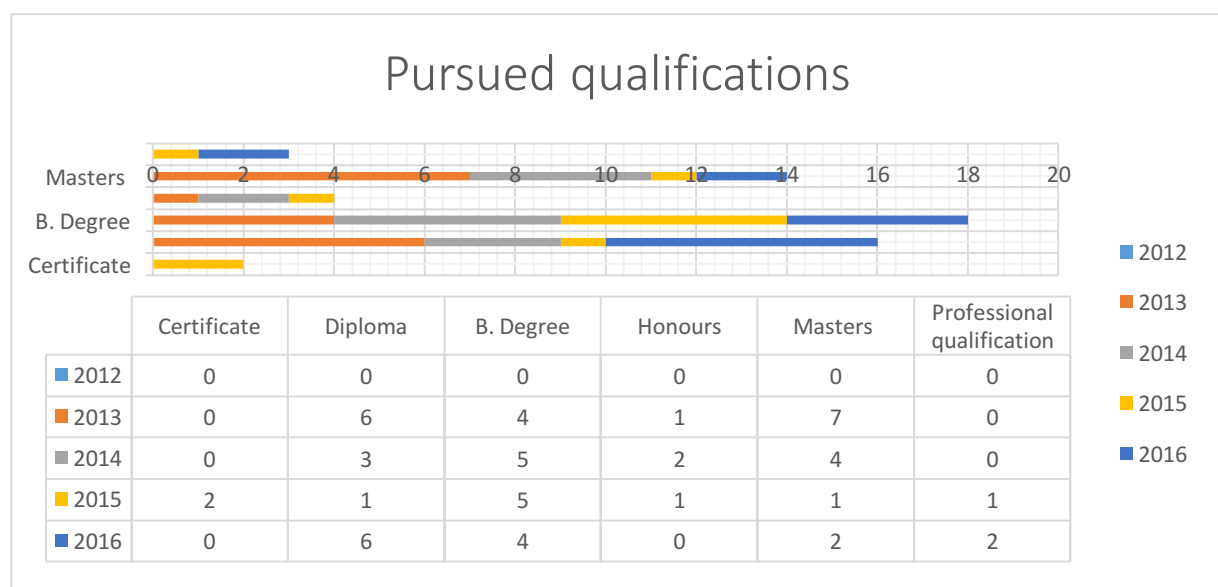
Figure 11: Typical qualifications pursued by regulator's personnel

Source: Annual reports 2012 – 2016

As shown in Figure 11, the employees are taking up higher education and professional qualifications. Master's and Bachelor's degrees are the most subscribed categories, both making close to 60% of the qualifications pursued and funded by the organisation. Certificates are the least pursued qualifications at just under 4% of all the qualifications.

4.9   Interviews data

4.9.1 Overview of respondents

The interviews were conducted with three key personnel within the line department responsible for the evaluations and approvals of new products for use in the Mpumalanga Province. The said personnel comprised of two line managers who were directly involved in the processes and are currently responsible for ensuring continued compliance of the product as it operates. The two line managers have combined experience of over 30 years in the gambling industry and possess tertiary levels of education.

The other respondent has over 20 years of experience in gambling regulation and overall experience in the gambling industry of 30 years. His career started in the operational side from a casino perspective. This respondent is a production worker with the official designation of an inspector, thus responsible for the continued inspections hence knowledge generation about gambling products.

Table 5: Interview data

Subject	Position	Role	Education level	Experience	Field of expertise	Current studies
Respondent 1	Operations Manager	Management	Tertiary	+20 years	Law enforcement	None.
Respondent 2	Operations Manager	Management	Tertiary	+10 years	Technical	Yes.
Respondent 3	Inspector	Production	Tertiary	+30 years	Gaming Systems	None.

Source: Interviews

The production worker is mainly responsible for the gathering of data and the monitoring of the gambling industry within the legislated parameters. This entails the planning of inspections such as identifying the areas of inspection, formulation of the scope, execution and reporting on the inspection. The management interviewees, mainly oversee and guide the production employee's activities and also ensure the availability and allocation of the appropriate

resources. The insights from these interviews are discussed and analysed in detail in the next chapter.

4.10   Model product – EBT

4.10.1   Generic pre-diffusion requirements and processes

The data shows that the process of introducing new products, such as the EBT, for consumption by the end users in the gambling industry is regulated and involves multiple stakeholders and processes (see National Gambling Act 2004, ss. 19-27). A review of the applicable legislation shows that, all gambling jurisdictions in South Africa have adopted similar legislative structures comprised of Acts, Regulations and Rules and they have all legislated on the requirements and processes applicable to manufacturers for bringing new products into the gambling market of their respective jurisdictions.

Once the innovating company (often also the manufacturer) has discovered and created a gambling product, such must be submitted to a testing laboratory which is accredited for technical testing through the South African Accreditation System (SANAS) for testing. Currently three such laboratories are accredited and licenced to test and calibrate gambling products for use in the South African gaming market.

In terms of the National Gambling Act, 2004, the laboratories are considered as testing agents and must test the products against the applicable standards, as well as the relevant provincial gambling legislation (National Gambling Act 2004, ss. 24 -25). At this level, a manufacturer is required to submit to the test laboratory all relevant documents, including software source codes and samples of the product to allow the laboratory to conduct the tests. Such tests include testing the functionality of the product, verifiability, statistical analysis, randomness and simulation of a live gambling environment amongst others (see, SABS (2008), SABS (2005), SABS (2003), SABS (2002), SABS (2005)). The laboratories remain in constant liaison with the manufacturer to clarify issues and to obtain additional information as necessary.

At the end of the test, the laboratory issues a test report to the manufacturer which indicates, amongst other things, a detailed description of the product tested, the standards and relevant legislation against which the product was tested. Issues of non-compliance, matters of emphasis or caution, and a general statement or recommendation on whether the product is suitable for use in the various provincial jurisdictions or not are also included in the test report.

The test reports are submitted back to the manufacturers for consideration. At this point, the product is not yet certified since this certification must be carried out by the CA. Prior to submission to the CA and after consideration of the report from the test laboratory, the manufacturer may address any shortcomings identified by the test laboratory in order to improve its prospects of success. Upon receipt of the final report by the test laboratory from the manufacturer, the CA evaluates such against the relevant SANS standards and, if satisfied that the requirements have been met, issues a letter of certification (LOC) to the manufacturer. Again, at this point and prior to the issuance of the LOC, the CA may also liaise with either the manufacturer that produced the product or the test laboratory to clarify issues and hence the manufacturer can address any issues on the product as obviated.

If an LOC is issued by the CA, the manufacturer may thus submit same to the intended provincial regulator for its approval for use in the relevant province. The regulator will then evaluate the product against the relevant provincial requirements and issue the final decision on whether the product is approved or rejected. If the product is approved, then operators, such as casinos, may purchase it from the manufacturer and offer it for use to the public after it has been verified by the inspectors of the regulator. Whilst in operation, the product is monitored for compliance and financial performance with such information also made available to the manufacturer if requested.

The EBT model product was no exception, hence it underwent the exact processes prior to it being made available for public use.

4.10.2 Model product submission and evaluation

According to the documents at the regulator, the model product was submitted for approval and use in Mpumalanga in January 2006 and it was intended to be used in Bingo halls. The interviews supported by the reviewed documents highlighted that, although the available gambling legislation provided for the licensing of Bingo halls and games (see Mpumalanga Gambling Act, 1995), no such licenses were issued by the regulator at that point, therefore, there were no operational Bingo halls. The applicable legislation did not, however, make provision for products such as the EBT although it did envisage electronic means of playing the game.

The submission by the PO comprised of the administrative documents about the product, i.e. the LOCs and Test Reports, which detailed its technical components such as the cabinet, the server, the game themes and the ticketing system. From the processes explained in the

documents, the regulator ordinarily requires the submission of the administrative documents relating to the new product only, and conducts its evaluation for approval based on these. The administrative documents are usually considered sufficient by the regulator to decide on whether to approve a product or not. In this case, the regulator required over and above the administrative documents that the PO provides a sample of the product and that it conducts a demonstrative presentation of such.

4.10.3   EBT product description

The documents reviewed show that, in the submission, the PO described the product as *"an apparatus used to play the game of Bingo and which allows multiple players to participate in a common game using a shared ball draw".* The submission was comprised of technical components and administrative features.

The EBT product is based on the game of Bingo, but has been designed to as closely as possible mimic traditional casino slot machines. This is according to the submission made by the PO. A historical review of the game of Bingo, indicated that the game has been played since the 15th century with its claimed origins credited to Europe. It has been played in South Africa since the 1960s and has since then undergone various changes and improvements (Mango, 2006, p.9), but its conversion into the EBT form as we know it today has been the most radical and revolutionary.

The game of Bingo is defined as;

> *"A form of lottery in which balls or slips, each with a number and one of the letters B, I, N, G, or O, are drawn at random and players cover the corresponding numbers printed on their cards, the winner being the first to cover five numbers in any row or diagonal or, sometimes, all numbers on the card."* (www.dictionary.com).

For the game to occur, several elements must be present. These are Bingo balls, cards that are divided into spaces with different numbers and symbols, and pictures arranged randomly (NGB, 2010). Furthermore, there must an announcer (a human being) who must call out the numbers. When the numbers are called, players daub, or mark the symbols and the first player to match the number with the patterns must call out "Bingo" and is recognised as the winner. Therefore, in its traditional and original sense, i.e. without the assistance of technology, the game of Bingo was played using a combination of animate and inanimate objects.

On the EBT format of the game, the documents reviewed and the interviews conducted show that the manufacturer used its knowledge assets comprised of amongst others, its experience in

designing gambling games, and other related products to embed the game of Bingo into artefacts. The EBT allowed for the total automation of the Bingo game in that it replaced most of the items required to play such as the balls, tickets, drawing machines, daubing markers, cards and the announcer with electronic and virtual versions of these items. Through the EBT, all the elements of the game, even the payment of the winner, are carried out electronically and automatically whilst the key elements of the game, such as the participation of a minimum of two people, are retained.

Being electronic and automated, and to distinguish the product from other electronic Bingo products, the manufacturer added features that are traditionally associated with casino gambling. These included virtual spinning reels, game themes, progressive jackpots, sound and lighting effects, amongst others. The added features were, and remain, the basis of the controversy in the gambling industry since they allegedly blurred the lines between the different forms and types of gambling products, hence classifying or codifying the product into a sector was a challenge.

Distinguishing and classifying (codification) between and amongst gambling products by sector is critical in the gambling industry and is etched in the industry's legislative and policy framework. Therefore, the EBT seemed to transcend these regulatory lines and perceived as undermining the existing regulatory and policy frameworks.

4.10.3.1 Model product technical components

The documents reviewed show that the EBT system was comprised of the following components:

i) A cabinet featuring two touch screen LCD colour display monitors with a cabinet topper.

ii) A server, which is a computer system that controls the database, accounting and game management functions. The Bingo server also contains the Random Number Generator (RNG) and manages ball draws and links players for competitive play.

iii) Various game themes with software stored on approved storage devices.

iv) Terminals which are the interface between the players and the Bingo game. Through the terminals, Bingo cards transactions are carried out, player credits are displayed and interim prizes awarded.

v) An electronic ticketing system.

4.10.3.2 Model product's administrative features

The administrative features of the game as explained in the documents submitted by the PO comprised of the following:

1. Test reports issued by test laboratories regarding tests conducted on the product against the relevant SABS specifications. Such tests included:

    i) *Software evaluation:* this included the evaluation of the game source codes against the standards;

    ii) *Artwork verification:* this was to ensure that the rules displayed to players are accurately explained and are aligned to the technical specifications by the PO;

    iii) *Mathematical evaluation:* to ensure that the theoretical return to player percentages in the technical documentation are in line with the PO's specifications;

    iv) *Combination test:* the combinations displayed on the product were simulated to ensure that the product pays correctly; and

    v) *Regression testing:* testing was conducted to confirm performance of the product against a wide range of functions and failures.

2. *LOCs* for the technical components. These were issued by the CA and they described the product, its origin, applicable jurisdictions, other products tested with it for interoperability, required and recommended configurations and conditions of use and method(s) of verifying the product. The LOCs further stated the jurisdictions where the product may be used based on the legislation considered during its testing. In this case the applicable jurisdictions were Mpumalanga and Gauteng. The LOCs also contained a statement of compliance against the applicable CA standard and the rules and regulations published by the regulators.

    The statement of compliance represents the CA's views regarding the product and carries a significant amount of influence in the provincial regulator's decision on whether to approve the product or not.

3. ***Game play features:*** The product allowed multiple players to participate in a common game of "Bingo" through a linked system using technological aids. To play the game on the terminal, players are required insert currency or a bar coded ticket into its bill validator and they select a card from the cards that can be viewed on the terminals' LCD screen. Players are only required to execute one touch to play it and utilises multi-denomination games on a variety of game themes. Though different in outward appearance, each of the games are premised on identical Bingo play and rely on the players responding to shared ball draws to generate the game outcome.

4.10.4 Public interest in the approval of the model product

EBTs generate controversy wherever they are introduced, mainly because they supposedly blur the lines between traditional casino slot machines and the game of Bingo. The product has taken away the daubing of the traditional Bingo card by the players and the excitement of matching "wits with fellow players and keeping pace with the caller" (Bowser, 2017). Essentially, all these functions have been delegated to a single machine.

The controversy surrounding the product was and still is a major issue in gambling circles, societal and political organisations. For Bingo hall operators, it generated renewed excitement hence an exponential growth in revenues. Whilst for casinos and other existing forms of gambling such as LPMs, it represented serious competition which will potentially affect their revenue negatively. Table 4 is a collection of article titles and their synopsis made by various parties regarding EBT between 2006 and 2016.

Table 6: EBT product in the media

Date	Author	Title	Synopsis	Position	Reason(s)	Category
2006	Gauteng Gambling Board	Approval of Bingo Terminals.	Explanation of the process and considerations when approving EBTs.	Pro-EBTs	In line with legislative provisions of the province.	Regulator
2007	T. Mango	Regular gambler's perception on Bingo.	Qualitative study by National Gambling of perception on Bingo and EBTs.	Neutral	A study presenting findings & no recommendations.	Regulator/ researcher
2008	J Du Plessis	Transvaal High Court Judgement.	Litigation by 6 applicants citing 8 respondents seeking to set aside the rollout of EBTs in Gauteng.	Anti-EBT	"Disguised slots machines."	Business/competition
2013	T. Ngobese	The blurring of the line between casino and Bingo.	Erosion of the line between casinos and Bingo has caused the two forms of gambling to be indistinguishable.	Anti-EBT	"Disguised slots machines."	Business/competition
2014	PAEBT	STOP EBT - The People's Forum Against Electronic Bingo Terminals.	A Facebook lobby page against the establishment of EBTs in KwaZulu Natal.	Anti - EBT	"EBTs are a slot machine's disguise" & negative socio-economic impact.	Lobbyists/ societal
2014	D. Mcpherson	DA calls for moratorium on issuing of EBT gambling licenses.	"Call for the Minister of Trade and Industry, to institute a national moratorium on the issuing of licenses relating to EBTs".	Anti - EBT	Disguised slots machines/poor regulations.	Political parties/lobbyists
2014	D. Mcpherson	DA welcomes ANC agreement to moratorium on Bingo Terminal gambling licenses.	"Chairperson of the Portfolio Committee on Trade and Industry, Joan-mariae Fubbs, (ANC) calls for the institution of a national moratorium on the issuing of licenses for electronic Bingo terminals (EBTs).	Anti - EBT	The use of EBTs, which effectively function as slot machines, is poorly regulated under the National Gambling Act".	Political parties/lobbyists
2015	Amil Umraw	Moratorium placed on Bingo terminals 'hard' gambling opportunity.	More than 300 community members lodged a petition opposing the offering of EBTs at a local shopping mall.	Anti-EBT	Socio-economic impact on an already impoverished community.	Societal/civics
2016	T. van Aardt	Casino bid to shut down Bingo halls comes under fire.	Bingo Association defence of a Bingo operator against a challenge by a casino.	Pro-EBT	Arguments that the casino blames its misfortunes on Bingo instead of looking at its business model.	Business/competition
2016	Cape Messenger	Electronic Bingo terminals challenged.	A casino in the Eastern Cape lodged court action challenging the use of electronic Bingo terminals.	Anti-EBT	Disguised slots machines creating "mini casinos".	Business/competition

Source: Personal collection

4.10.5   Regulator's processes – post product submission

The documents reviewed especially internal reports show the following processes undertaken by the regulator:

Process 1: Clarification

- The regulator *invited* the PO to demonstrate the product, explain its intended use and respond to questions that may arise.

Process 2: Collaboration

- Other public regulators who were not originally affected by the submission were also invited to observe the demonstration as per *Process 1* above, ask questions and provide inputs.

Process 3: Research

- The regulator embarked on a process of *research* whereby various other regulators within South Africa and internationally were consulted for inputs. The research also included a visit to Gauteng which was the only jurisdiction to have currently approved and operating a variety of the product.

Process 4: Review & analysis

- The applicable legislative prescripts governing such products i.e. the provincial gambling act, national act, technical standards, the regulations and rules were considered.

4.10.6   Regulator's findings and conclusions

From the research conducted and the analysis of various inputs, the regulator found that:

Finding 1: Insufficient/inappropriate test conducted

- The product was not tested against the appropriate technical standards, national or provincial legislation, in that it presented a form of a server based gambling solution. However, it was tested only against standards for non-server based casino product.

- The testing of the product against standards for casino equipment was considered inappropriate since it did not attest to its functionality in the Bingo market where it was intended to operate.

Finding 2: No technical standards in existence

- At the time of the submission, there were no published standards for server based gambling hence products of such a nature were not approved and allowed for consumption by the public.

Finding 3: No interoperability testing

- The product was not tested for compatibility and interoperability with currently approved CMS' which thus raised concerns regarding the monitoring and accounting of the Bingo product.

Finding 4: Close resemblance to casino gambling machines

- The product resembled casino gambling machine too closely, such that it was difficult to differentiate them. It also offered the same types of games found in casinos with their respective styles of play.

Finding 5: Ongoing litigation

- At the time of its submission in Mpumalanga, the product was already approved for use in Gauteng by the Gauteng Regulator. However, such approval was subject to a court challenge by at least six casino operators in that province. As such, the MGB thought it would be prudent not to approve it pending the court action *(Finding 6)*.

Regulator's conclusion

Accordingly, the manufacturer of the product was informed that the application for approval of the EBT is not successful and the regulators findings were provided as the basis for its rejection. Upon receipt of the outcome, the PO fundamentally repudiated the regulators reasons for declining the approval.

4.10.7   Contribution of other parties regarding the product

4.10.7.1 Industry stakeholders

Evidence of contribution by other parties was found in the documents submitted to the regulator. These parties also made observations regarding the product directly and indirectly. Some of the inputs, especially those from casinos and other manufacturers of similar or related products, were unsolicited but provided nevertheless, seemingly to protect existing business interests. Some of the submissions in the reviewed documents were as follows:

i) The NGB recommended a moratorium to the further licensing and roll-out of the product by all provinces pending investigations to be conducted by the National Gambling Policy Council. In this regard, it was envisaged that the investigation will seek to determine the impact and nature of the EBTs within the National Gambling Act and other policy considerations.

ii) The provincial regulator in Gauteng, which had already licenced the EBT, provided its background and rationale behind the licensing of such product. It argued that it found the product suitable for approval and use within its province and that all legislative requirements were appropriately satisfied.

iii) Casinos and competing manufacturers also argued against the licensing of a product on the basis that it does not meet the criteria set in legislation for such products hence its licensing was unlawful. Furthermore, the objections were on the basis of it being an unfair competition, which circumvents existing legislative requirements.

4.10.7.2 Information arising from litigation

Litigation by existing stakeholders in the industry which for competitive reasons was aimed at preventing the further rollout of the EBT product provided further insights on how independent parties view the product. In this regard, judge du Plessis of the High Court, Transvaal Provincial Division (Du Plessis, 2008, p.3) found and ruled that:

i) The game and its product were markedly identical to existing slot games and machines currently found in licensed casino, therefore the game played is not the game of Bingo.

ii) The alternate contention in this regard was that if the game played is indeed the game of Bingo, such was not played in accordance with the approved rules of the game.

iii) There was insufficient and no appropriate legislative and regulatory framework to approve and regulate the EBT devices and the games played therein.

iv) The lack of testing standards to test the product to ensure its fairness, accuracy and auditability thereby protecting revenues and the players.

v) It was suspected that the game fails to yield the minimum return to players required in terms of legislation.

4.10.8 Product diffusion enablers and inhibitors

From the POs submission, industry opinions, regulators' and Court findings or conclusions various enablers (EDs) and inhibitors (IDs) of approval and diffusion of the EBT product, are summarised and classified as follows:

Table 7: Product diffusion enablers, and inhibitors

	Decision value (DV)	ED	ID	Source(s)	DV Type
1.	Incorrect standards used to test.	No	Yes	MGB; High Court.	Codification.
2.	Lack of interoperability testing.	No	Yes	MGB; High Court.	PO non-compliance.
3.	Sector ambiguity.	No	Yes	MGB; High Court.	Codification.
4.	Insufficient regulatory framework.	No	Yes	MGB; High Court.	Abstraction/codification.
5.	Insufficient regulatory framework.	Yes	No	PO; GGB.	Obfuscation/interpretation.
6.	Below required RTP.	No	Yes	High Court.	PO non-compliance.
7.	Compliance with minimum regulatory framework.	Yes	No	PO; GGB.	Obfuscation/interpretation.
8.	No requirement for interoperability tests.	Yes	No	PO.	Obfuscation/interpretation.

Source: Personal collection

4.11 Chapter conclusions

The organisational data gleaned from the MGB has shown the organisation's inclination towards knowledge work with a high degree of knowledge intensity. Ultimately, it is the central point where an overall perspective of the industry can be found through careful mining of the data it collects, analyses and stores. The way the regulator is organised, its processes, and emphasis on further training and autonomy of its employees supports the case of recognising the company as a high-end knowledge development institution. Accordingly, its employees also view themselves as key contributors to the knowledge development processes based on their activities in the evaluation of new products such as the EBTs.

Finally, the model product highlighted in specific terms the contribution of the regulator into the EBT product and pointed towards attributes that are of benefit to it, which were not included in the original submission by the PO. The next Chapter considers these observations and provides their analysis against applicable knowledge management literature.

Chapter 5 – Discussion of the empirical observations

5.1   Regulator's knowledge posture

5.1.1   Knowledge intensity and autonomy

Since the model regulator (MGB) deals primarily with intangibles, Alvesson (2004, p.17) cited in Newell et al (2009, p.31) would classify the organisation as a Professional Services Firm (PSF). As such, it will be typically expected to deal with its clients directly, as it currently does. Depending on its size, it is expected to organise as a professional bureaucracy with traditional hierarchical lines or Managed Professional Bureaucracy (MPB), with recognised codes of practices and clearly defined career paths (Newell et al., 2009, p.30).

The regulator mostly fits the description of a PSF-MPB, mainly due to the large variety of professionals it employs, the absence of a distinct code of ethics, requirement for professional affiliation and specific educational requirements which restrict entry. The basis of describing it as a PSF-MPB is likely a result of the posture of the gambling industry, which is a fusion of diverse professions working as a system to achieve a desired goal. Professionals such as accountants, lawyers, IT specialist, food and beverage, and hospitality personnel are all almost equally important for the successful functioning of the industry.

The senior and operational managers of the regulator, however, are currently comprised mainly of accounting professionals such as auditors and financial personnel. For instance, of the six executive managers (see Figure 9) at the MGB, four are accountants and the other two are legal and IT professionals. These are in line with the minimum requirements of the positions. It therefore follows that many the production workers are also professionals in the accounting, legal and IT professions. Some diversity of the professionals is, however, prevalent in the compliance department, which contain former gambling industry professionals trained in various fields such as IT, technical operations and law enforcement.

True to Newell et al's. (2009, p.53) prescripts for knowledge intensive firms, the organisation heavily relies on its workforce for competitive advantage. The organisation recognises this and mentions its employees as part of its strengths in its internal analysis (MGB, 2015, p 61).

Autonomy is mostly evident in the compliance department, which comprises most of the esoteric skills specific to the gambling industry. In this regard, the employees mainly set the agenda regarding areas of evaluation, frequency, and specific areas of focus within the legislative confines governing the institution. For the other departments autonomy is inhibited

by the nature of the work. For example, once a license application is submitted, it must comply with very specific legislative requirements, thus leaving very little scope for creativity in problem solving and organising.

5.1.2   Regulator's knowledge positioning

Regulators are often typified as knowledge exploiters and less as explorers of knowledge (see Newell et al., 2009,231, Boisot, 2008, p,34). These hypotheses position regulatory firms as consumers of already created knowledge without any real expectation of knowledge production on their part. But this claim does not sufficiently appreciate that once knowledge has been created and diffused, there is always scope for secondary knowledge creation upon the presented knowledge product.

The secondary knowledge creation space is probably the realm of public regulators who, by the nature of their composition, are not encumbered with knowledge creation expectations. Augmenting existing products is where they are positioned. However, like the primary knowledge creation that brings a product into existence, augmentation also requires knowledge creation. From the empirical data gleaned from the MGB and the model product, clearly the regulator views a role beyond just passively consuming and exploiting created knowledge.

Looking at its mission i.e. *"to be at the forefront of effective gambling regulation of the gambling industry",* and its objectives of co-operation, research, and rendering advice to government, all require and imply a knowledge exploration rather than exploitation posture.

Being at the "forefront" of the whole industry, as its vision sates, behoves the organisation pursuing such a strategy to explore alternative or novel ways of regulating that are not currently being used by other comparable regulators. This requires knowledge creation, which is exploration. Firstly, it must know and understand the issues in the industry and the existing regulatory approaches and devise better and new ways of doing such. For example, the creation of a completely new category of a licence or the regulation of a new product that was not regulated before. In such regards, knowledge must be created, therefore innovation must occur.

Furthermore, the regulators' objective of co-operation, research and rendering advice to government cannot be effectively fulfilled without an effort and attempt at knowledge creation. It is good and well for an organisation conceptually created and modelled to be a knowledge exploiter, such as regulators, to have strategic ambitions related to knowledge exploration and according to literature, more suitable for knowledge exploiters. It is also perhaps naivety, arrogance, ignorance, or all of this, for such organisations to even consider including these

"lofty" and unorthodox ambitions in their strategic postures and objectives. However, the empirical evidence suggests that the regulator does not think of itself as a mere consumer of new knowledge and products. Instead, it thinks and models itself as an active participant in the knowledge development process, hence the constant preparedness through the way it is organised and supported by the perpetual training and education of its people.

5.2   Regulator's knowledge processes

5.2.1   Inter, and intra-organisational knowledge issues

There are various inter and intra-organisational contextual issues that either enable or inhibit knowledge work. Amongst these, Newell et al. (2009, p.240) identifies culture, diversity, autonomy and shared perspectives as key knowledge enablers.

As evident from the empirical findings, the successful diffusion of knowledge products demand inter, and intra-organisational context amongst the organisations involved in the process. Within the submitting organisation, referred to as the PO in this regard, a culture of knowledge work must prevail. For example, trust, autonomy, and diversity must be a staple phenomenon. This will thus be evident in the products that the organisation creates, in the form of their diversity, uniqueness, and the frequency within which they are presented for diffusion. These conditions must be prevalent at the regulating organisation, which will provide the necessary wherewithal to expertly evaluate the POs products and take well-reasoned and articulated decisions.

Over and above the internal contexts within the POs and the regulator, there must be a knowledge-work friendly inter-organisational context. For instance, both organisational contexts must encompass diversity, autonomy and shared perspectives, amongst other requirements. Discrepancies in the knowledge contexts between the PO and the regulator will most likely frustrate the product diffusion efforts of the one and the regulation efforts of the other. As an illustration, a PO that is too far ahead of the regulator, which it is subject to whose authority, risks frequent rejection of its product diffusion efforts by such a regulator due to the latter being left too far behind in the innovation process. Therefore, such POs risk wasting R&D resources and inhibited growth.

Similarly, the regulator should also not be too far ahead or behind the PO in terms of readiness to assess new products submitted by the former for diffusion. The relationship between the two organisations is therefore symbiotic and a culture of constant inter-organisational knowledge

sharing is required. Both parties must always be transparent and engaging on developments on either side and this requires a context of trust.

The circumstances around the EBT suggest disparities between the PO and the regulator in terms of the expected or allowable functionality of the product. Hence, this may be an indication of deficiencies in the inter-organisational relationship between the parties. However, for reasons of competitive advantage and market share, it is expected of POs to test, and where possible, push the limits. The POs submission, in this regard, railroaded the regulator to initiate a process of knowledge creation, sharing and codification about the model product. As an example, the regulator's request for a demonstrative presentation *(Process-1)* was aimed at identifying features of the product and the subliminal tacit knowledge and issues about it that are necessary but not included in the POs submission. Process-1 was initiated because the regulator had to evaluate an unfamiliar product.

5.2.2   Knowledge creation context-issues

As shown by the empirical data, regulators do not typically request POs to demonstrate and field questions about a product when it is presented. Following on Nonaka's (1994) SECI model cited in Newell et al. (2009, p.8), the demonstrative presentation was on the surface an act of socialisation. In this regard, tacit-tacit knowledge conversion occurred during the interaction between the PO, the model regulator and other regulators present during the presentation of the product. By bringing all the parties together, the regulator created the enabling context propagated by Nonaka (1994) for the concerned individuals to "create and share knowledge" about the model product.

This individual, inter and intra-organisational knowledge sharing was unlikely without the model regulator's insistence. Had the model regulator opted to just interact with the documentary submission, the wider socialisation hence tacit-tacit knowledge conversion would not have happened. The aim of the regulator in this regard, ultimately, was externalisation of the knowledge about the product that was gleaned during the socialisation process.

5.2.3   Issues of collaboration

From the socialisation efforts of the regulator, the evaluation of the product became a multi-faceted collaborative effort (*Process-2*). As the empirical evidence shows, unsolicited inputs and observations about the product were received from parties which were not seen to be related with or affected by the product. As evidenced by the various challenges faced by the product later in the diffusion process, its evaluation required a diversity of views from within

the gambling industry, civil society, and the legislative bodies. These inputs proved pertinent in the evaluation and the subsequent decision of the regulator about the product.

The latter processes of the regulator *(Process-4 & 5),* i.e. research, and the consideration of the legislative requirements complemented the socialisation and externalisation processes already initiated, and served to enrich the knowledge created for and about the product.

All the regulator's processes *(Process-1 – 5)* yielded valuable additional knowledge about the product which would have otherwise not come light. Primarily, these processes produced the regulator's findings and conclusions about the product (*Findings-1* – 5). Secondly the POs views and rationales about its product which would be unknown if the regulator did not provide the avenue for discussing it, came to light. Lastly, the regulator's processes inspired other parties to provide their views on the product.

5.3. Analysis of interviews

5.3.1 Processes and knowledge intensity

The respondents highlighted results from tests conducted on new products as a key source and basis of new knowledge, which is critical in decisions on whether to approve, decline or rescind an already approved product. As such, the respondents indicated that tests were, and continue to be, conducted on the EBT product pre and post-diffusion and that this is not unique to this product. The autonomy provided by the environment at the regulator allows the production workers and the operations managers to design these tests and tailor them to address specific areas identified for particular products, such as the EBT. Further to meeting the specific requirements by the subject of the tests, two of the respondents indicated that testing highlights legislative inadequacies, which are later presented to the regulator for possible amendments. Instances where legislation was influenced by the respondents were highlighted.

The respondents' perspectives on knowledge intensity, types of training required and the processes followed in the evaluation of products were similar in many respects. They all indicated an internally articulating layered process which starts from the production worker, in this case an inspector, who performs the initial evaluation and the prerequisite checks for completeness and correctness of the product's submission. The outcome at this stage is preliminary opinion intended for internal consideration by the operations manager. The manager also performs an evaluation on the product and the work already done by the inspector, but this is mainly a quality control verification. As an outcome at this stage, the operations manager may refer the evaluation back to the inspector, and direct a re-evaluation, further tests

and/or experiments on the product. If the operations manager is satisfied with the evaluation of the product by the lower level worker, this is as good as a "soft approval" of the product that is awaiting executive signoff. Whilst questions for clarity and other relevant requests may be advance to the PO, none of the "soft findings" are externalised until official executive sign off.

The multi-layered and articulating evaluation process within the regulator serves many purposes, chief amongst those being the minimisation of errors in the evaluation and the approval. Such has collaboration, teamwork and knowledge sharing embedded in it, in that the ultimate decision on whether the product is approved or rejected must, and will, contain inputs from the inspector, operations and the executive level management. Ultimately, all three levels of evaluation are accountable for the decision to approve or reject the product. Knowledge development therefore thrives under these circumstances, since the collective accountability compels and ultimately induces a relationship of engagement through debates, trust and inter-reliance amongst the evaluation and approval cohort.

Thus, it is to be expected that the respondents understanding of the processes of evaluation were uniform regardless of the position they occupy. Because these processes were created and refined by the regulator over the years, it can be inferred that the regulator was successful in communicating and embodying them to its employees. In the first instance, the regulator determined the level of skills required after processes of job-grading and evaluation. Further, it was the same regulator who determined the appropriate levels of compliance from products requiring approval in its jurisdiction.

The respondents, as the regulator's employees, were employed because they were seen to meet the regulator's requirements thus perceived as able to execute the regulator's mandate. As a knowledge intensive firm and a system, the understanding of the processes and requirements of a project are some of the basic requirements for successful knowledge development. This is seemingly prevalent at the regulator as demonstrated by the respondents.

5.3.2 Deficiencies in process and knowledge intensity

Despite the uniformity of the responses on the issues of process, there were deficiencies in the overall knowledge development process for the evaluation and approval of products. These were gleaned mainly from the responses of the production worker and the inspector, but not so much from the operations managers.

The inspector respondent intimated that the higher-level executives, who ultimately approve or reject product submissions, do not possess sufficient technical knowledge about such products, hence the specific value of their contribution is inconsequential. The executive management cohort of the regulator is comprised mainly of accountants and some IT and a legal professional. However, their technical knowledge on the evaluation of gambling products, such as the EBT, is rudimentary at best. Primarily, the expert technical evaluation and analysis of the products is carried out by the operations manager and the inspector, hence if the frontline evaluators are satisfied it is highly likely that the product will meet executive approval. As such, the evaluation of the product at executive level, which is the level that decides the diffusion fate of the product hence the most powerful, is largely ceremonial.

In Figure 12, the knowledge input of the different levels of evaluation is indicated and contrasted against their formal power. Knowledge input was considered against the role of the position in the evaluation, whilst formal power refers to the impact of the decision on the diffusion trajectory of the product.
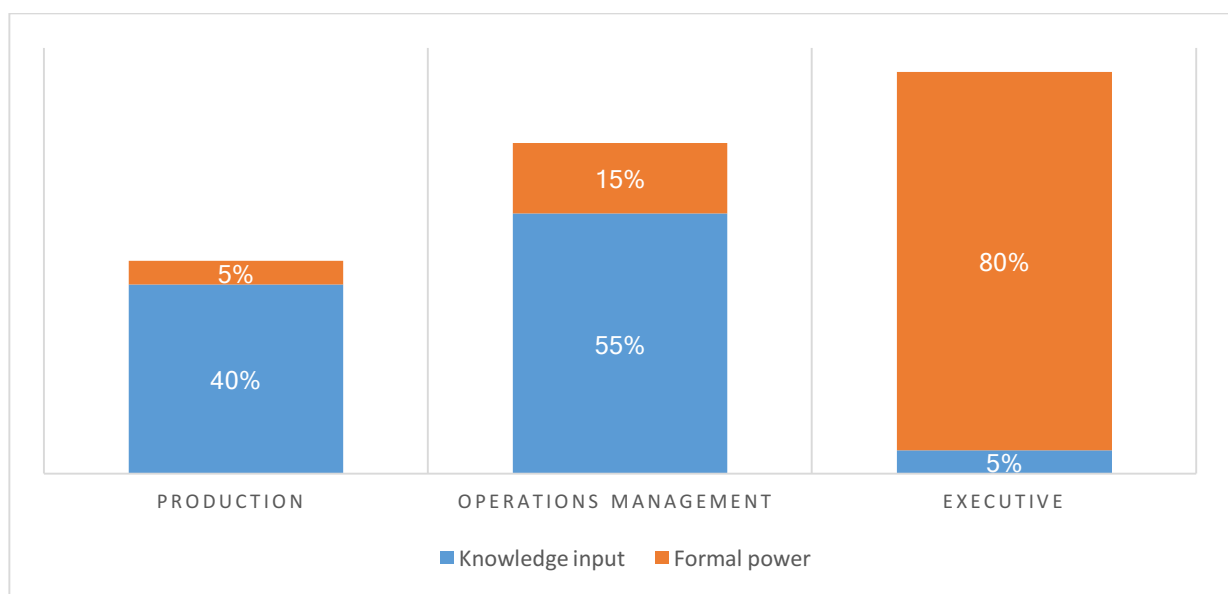
Figure 12: Knowledge input & formal power

Source**:** Personal collection

The incumbent at the executive level is authorised by the position they hold to speak about products submitted for evaluation at the formal structures, conferences and various platforms. Contrarily, the production workers and the operations managers are typically not part of such forums, or in cases where they are, they attend as invitees and only contribute to discussions if requested. Consequently, much of the power is concentrated at the executive level, yet it has

the least knowledge contribution which seems ironic and to an extent a missed opportunity for the further development of relevant knowledge about and for the product.

5.3.3   Project work and collaboration

In explaining the nature of their work, regardless of whether it is production or operations management, all three respondents emphasised the project nature of the work. Many of the tasks involved have a defined starting and end point. In respect of new products, the projects begin when these are submitted and the evaluation process ensues, and they end when a recommendation or decision is taken on the project. The respondents highlighted different starting and ending points. For the production worker (inspector) and operations managers, the project ends when they make recommendations, whilst for the regulator it ends when the decision about the product is communicated to the PO.

Regarding collaboration, the respondents emphasised its importance and called for more regular interaction amongst all stakeholders in the industry. The collaboration efforts of the MGB in the evaluation of the EBT were generally noted as a positive aspect and an important ingredient for knowledge development. The importance of collaboration was also highlighted by the adoption of CMS requirements by the other regulators after noting its benefits from first movers such as the MGB.

5.3.4   Regulatory stringency and innovation posture

Regulatory stringency or flexibility, can, according to Stewart (2010, pp.4-5), determine the cost burden of compliance and the probability of dud innovations. Regarding stringency in particular, Ashford et al. (1985, p.426) cited in Stewart (2010, p.5), states that this is the most important factor influencing technological innovation. Accordingly, the posture of the regulator towards innovations was probed to determine stringency and flexibility of its approach. As such, the statement *"regulators are generally regarded as inhibitors of innovations due to their bureaucratic postures and perceived lack of knowledge and interest in innovation"* was put to the respondents.

In broad terms, the respondents viewed theirs as a crucial role in the process which must be maintained. This position was mainly taken from a social welfare and integrity point of view and a general antitrust perception of the product manufacturers and ultimately the operators. Simply put, the manufacturers and operators should not be entrusted with the responsibility of social welfare friendly products, hence the regulator must stay alert.

Accordingly, the respondents viewed the current processes as insufficient and too flexible, which favours the manufacturer. This thus allows a high degree and turnover of new products, which leaves the regulators too far behind in the regulation spectrum. As such, the respondents were of the view that the regulators are mainly reactive in their approach and do not initiate regulations that promote innovation. However, the respondents recognised and highlighted that the regulators only must create an environment conducive to innovation and do not necessarily have to create the products themselves.

Also, the respondents saw regulations favourable to innovation as a weakness in the legislative framework, which must be tightened to ensure that products such as the EBTs do not find space in a regulated environment, unless and until regulations explicitly call for such. One of the respondents therefore preferred a zero-tolerance approach to products that are not sufficiently clarified in regulations or products that exhibit traits of non-compliance with existing requirements. Comparisons were thus drawn with similar regulators in the country, and the respondents opined that the stringency of the regulation and the evaluation process must be adopted by all gambling jurisdictions in the country to ensure uniformity and social welfare on a national scale.

The views around regulatory stringency and flexibility are subjective based on the holders' role in the innovation equation. Proponents of social welfare, such as regulators, always consider the latest threats to the integrity of products, whilst private sector capitalists are more concerned about increasing market handle through novel products. Of importance to the innovators is the degree of change required to innovate and yet remain compliant with the regulations. In this regard, Stewart (2010, p.5) opines that innovators will take the innovation route that requires minimal compliance, thus cost effective.

The least costly route does not always yield the most innovative product, thus potentially and inadvertently stifle innovation. Similarly, the stringency of the regulation may cause the innovator to intensify the innovation process by going beyond the orthodox processes. Therefore, whilst the interests of the regulator are equally important, the stringency of the regulation proposed by the respondents must be cognisant of the impact of such on the manufacturers so that the interests of both are balanced. The regulator must therefore consider if gradual or disruptive introduction of the stringent requirements is appropriate.

5.3.5   Regulator's contribution to products

Accordingly, the respondents were of the view that the regulator makes a significant contribution to the products, and highlighted that such a contribution is often not recognisable

due to perceptions in the industry about the role of regulators in the process. The respondents all provided specific examples of areas where the regulators' contribution is mostly notable. Regarding this aspect, the operations managers highlighted the inclusion of CMS as part of the products' attributes and operational requirements as the most apparent of the regulator's contribution.

The PO initially did not intend for this functionality, however, the regulators pointed out the benefits of having such for the product owner, operators and the regulator. Amongst the benefits of the inclusion of the CMS as part of the product, one of the respondents highlighted the skills development aspect particularly for the operators and its staff. Without the CMS, the EBT did not provide the analytical tools required to understand the operations of the Bingo business, as such the introduction of the CMS provided these tools. However, to operate this additional tool, navigate through its functionality and to maintain it, additional skills had to be developed at the operator's level which was duly done.

Despite the success and achievements in the evaluation process, the respondents highlighted issues that inhibited the effective evaluation of the EBT and other products submitted. In the main, the high volume of submissions was regarded as a major factor that compromises the quality of the evaluation. Furthermore, whilst they all generally agreed and felt that they are adequately skilled to evaluate the product, the respondents all submitted that they are always at least one step behind the private sector POs in respect of the new products and innovation.

5.4   The model product - EBT

5.4.1   The model product through Boisot's lens

Products that yield sustained competitive advantage are sometimes found in the most obvious of places, but to uncover them a certain type of knowledge and skills are required. Not everybody or firm possess such know-how. Appropriately so, Boisot (1998) proffers that "products communicate more than what they were designed and sometimes say a lot more about the organisation or person that brought them to being". Boisot thus implies that a lot more than what is explicit can be learnt about an organisation through the products it produces.

The EBT as a product of knowledge development is an apt embodiment of the point about gambling being a business of knowledge and information. In totality, it represents a certain level of knowledge embedding. The PO used existing knowledge assets as contained in the three dimensions that Boisot (1998) describes, i.e. knowledge in people's heads, documents, and artefacts. In its disaggregated form, the EBT product provides some useful insights about the discovery, creation and application of knowledge.

Following on Boisot's I-space analogy, the manufacturer of the EBT fused existing Bingo (traditional/manual) with existing products i.e. the game of Bingo and casino games (already successful) to bring it to being. The game of Bingo is played in most countries the world over, therefore can be said to be highly codified, abstracted, and diffused.

Being available and played in different countries means that it has been adapted to a wide range of contexts, languages and cultures. This high codification aspect of the game stems from the fact that knowledge surrounding it has largely been captured through various means; and instructions on how it is played are widely available in all sorts of mediums e.g. books, pamphlets, magazines, the internet amongst other forms. It is so widely played and ubiquitous in gaming and non-gambling circles that knowledge regarding it can be considered as already embrained and embodied in people's heads. This to the extent that the manuals and instructions are no longer necessary in some respects.

Although the game is essentially a gambling game, therefore ordinarily expected in a gambling environment, its high levels of abstraction has made it applicable and played in a diverse range of sectors and circumstances. As an example, it is used and played in social settings for fun, in Bingo halls purely for-profit purposes, amongst others. Even religious organisations, who are ordinarily opposed to gambling, are known to be using the game to supplement their income from bequests and other donations.

The levels of its diffusion can thus be attested by the game's availability to agents who wish to use the knowledge about it. And, in this regard, the statistics about the uptake and popularity of the game of Bingo vary amongst the available sources. The number of Bingo players is estimated at over 100 million people worldwide, therefore, the obvious consensus is that amongst the potential Bingo audience or consumers the diffusion and even uptake is high (Snowden, 2016).

5.4.2   Schumpeterian (S) learning dimensions of Bingo

Bingo is over 600 years old, therefore, its advancement to the highest possible levels of the I-space are expected. In Neoclassical descriptive terms, the current wide diffusion and adoption of the game could be credited to the cumulative elimination of errors and clarification of fuzzy areas in its early years (Bosiot 1998, p.99). As an example, at its early implementation for a church fundraising in Pennsylvania, USA, it was detected that the game produced more

winners, thus making it financially unattractive. To correct this, more number combinations were developed, thus keeping it interesting and profitable (Snowden, 2016)**.**

As Boisot puts it, through perpetual error detection and correction the knowledge about Bingo has been objectively verified and accepted albeit at the expense of it becoming inert. It is the possibility of such states of inertia that provided the owner of the EBT version of the game with the platform to launch a new knowledge product (EBT). According to Boisot, having reached the state of inertia, knowledge and hence products based on such become reliable and provide a solid supporting foundation for further learning, thus further knowledge creation and development (Boisot, 1998, p.97). Since knowledge is based on memory (Weick, 1995: p.5) and its usage is economised through experience, therefore, Bingo as a game provided a memory and experience base for the EBT as a knowledge product.

The second dimension of inert knowledge such as the Bingo game, as Boisot (1998) puts it, is the embeddedness of the foundational errors in such knowledge which must thus be carried over and built upon when new knowledge and products are developed further. About to the Bingo game, such was played using specific rules, requirements and products. For any improvements or variations of the game to claim the use of the Bingo name, it had to retain the use of some of the original requirements. These constitute the equivalent of the difficult foundational errors, which cause discontinuous knowledge creation and application for knowledge products later.

As an example, for EBTs to be considered as a game of Bingo, the element of multiple participants which stems from the original social character of the game had to be retained and built into the EBT. The implications herein are that the playing of the EBT game must be delayed until two or more players participate in the play. Again, this was necessary for the social interactions enforced by the Bingo game in its early stages, and highly desirable in church fundraisers or interactions in pubs on a Friday night, for example. However, for the pure gambling profit making sense where the interaction is between the player and the EBT product, the social interaction is loathed by players and operators alike. But it had to be built in for the game to stake any claim of being a game of Bingo albeit in an electronic sense.

If the Bingo to EBT evolution is to be analysed in Schumpeterian learning terms, the arguments would stem from the philosophical ontology that all products, thus all knowledge, regardless of their positioning in the I-space, are hypothesis thus subject to repudiation or validation. By building on an existing widely accepted, used and by all accounts successful knowledge

product, the submitter seeks to validate, repudiate and or improve on the knowledge base of the product.

5.4.3   The model product and the codification conundrum

From the myriad of concerns engrossing the product as shown in the empirical findings, it is reasonable to conclude that some of the issues associated with it were mainly codification and abstraction related. As per Boisot (1998, p.84), fuzzy codification and abstraction schemes are to be expected from emergent technologies, such as this model product, since they are typically unstructured. For instance, incorrect standards were used for testing since there were no available standards applicable to the product, therefore, the next available standard was the casino's which was thus used. However, the use of the casino products' standard led to the sector ambiguity regarding the product which exacerbated the codification concern.

The regulators and the industry were thus grappling mainly with, first, in which of the legislated and authorised gambling categories and sectors to place the product. Secondarily, was the product suitable as a Bingo game belonging to Bingo halls or was it casino related and to be placed in casinos? Alternatively, was it a completely new product requiring a fresh code or classification?

Boisot (1998, p.44) terms codification as the act of "creating conceptual categories that facilitate the classification of phenomena" through a process known as coding. When the EBT was submitted for approval, generic conceptual categories described by Boisot (1998) were already in existence and fully functional in the gambling industry. These consisted of Casinos, LPMs, Horse Racing & Betting and Bingo (contentiously, in its traditional form).

As such, in their evaluation of new products, regulators and the other gambling industry stakeholders affected, in general first attempt to assign the product/phenomena in the existing broad industry classes. Then, within those classes, further subclasses and categories are applied to serve as a guide on the appropriate evaluation criteria to be used. Boisot (1998, p.44) notes that a high number of codification choices and classes increases the complexity of the codification task, which thus becomes time consuming.
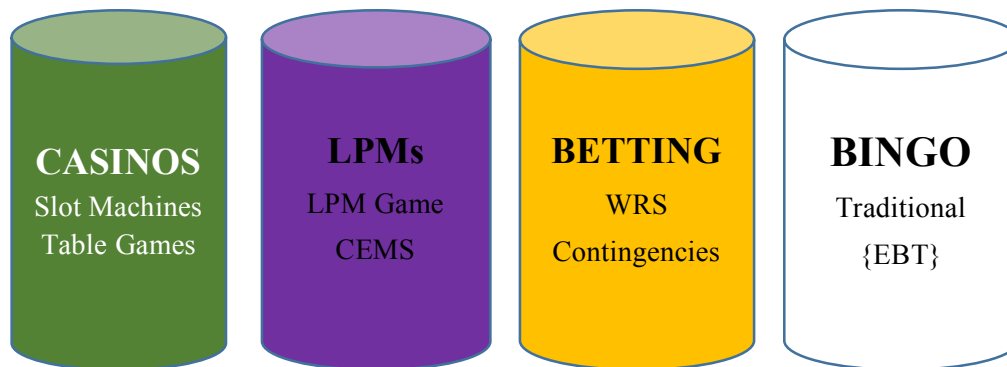
Figure 13: Codification of gambling sectors and products

Source**:** Personal collection

The codification uncertainty around the product presented a time-consuming complex problem which thus extended its evaluation time hence its approval for diffusion. As shown earlier, the MGB and other regulators generally require the submission of administrative paperwork associated with a product for it its evaluation. But, for this product more extensive research including a demonstrative presentation was required to discern what it is, where does it belong and whether it can be approved or not. Even in its response to the PO, the regulator cited codification related reasons for its rejection such as the testing against inappropriate standards, the absence of appropriate standards to test it, its encroachment on features attributable to products categories such as casino products *(see Finding 1 – 5).*

Boisot (1998, p. 43) states that, tasks, in this case products, that are less codified require a greater amount of data processing thus time consuming and highly complex and laden with uncertainty. Our model product supports Boisot's thesis in many fronts, for example, the product was first submitted for approval by the regulator in 2006, yet it was only approved and allowed for use in 2011. Typically, the lead times for approval of products in Mpumalanga and various other gambling jurisdictions is at least one week on average. This is possible mainly because the products submitted are usually adequately codified according to the appropriate gambling sector and tested against the relevant standards.

Furthermore, the fuzzy codification scheme of the product delayed its approval and rollout in other provinces in South Africa, whilst for adequately codified products, POs typically deploy

these simultaneously in all the nine provinces. For a long time (2006 – 2011), Gauteng and Mpumalanga were the only provinces where the EBT product was approved. Other provinces followed much later on after the product had settled into a codification scheme.

5.4.4   Chapter conclusions

A high level of knowledge intensity and autonomy in certain departments of the organisation was highlighted in this Chapter and analysed against KM principles espoused in Newell et al. (2009). The analysis against the KM principles led to the classification of the organisation as a PSF-MBP because of the assortment of skills it requires and employs to fulfil its mandate. As a PSF-MBP, the Chapter highlighted the traditional hierarchical lines of organising its resources and activities. Accordingly, it became clear that the organisation derives competitive advantage mainly from its employees whom it aptly recognises as one of its key assets. Regarding its knowledge posture, the empirical analysis shows that the regulator positions itself for both knowledge exploration and exploitation; rather than the typical posture of exploitation which is ordinarily associated with such organisations.

In terms of the processes that lead to knowledge development for innovation, various inter and intra-organisational issues that either inhibit or enable knowledge work were identified. In the main, culture and diversity largely stood out as key considerations. Analysis of the interviews in particular, highlighted these and other inhibitors and enablers. Potential inhibitors were noted from the inclination of one of the interviewees towards a more stringent approach which stifles innovation in some respects. Further deficiencies in the knowledge development process related to the amount of power vested in high level executives even though their technical contribution into products was viewed as inconsequential. On the enabling side, issues of collaboration and a conducive context for knowledge development were noted and analysed.

Leaning on the enabling and inhibiting factors, the regulators' contribution was distinguishable from the original product attributes. Accordingly, a detailed discussion of the regulator's contribution will be undertaken in Chapter 6. The totality of the empirical analysis, was put into Boisot's (1998) and Schumpeter frameworks.

Chapter 6: Conclusions

6.1   Current position

As at March 2017, there are two Bingo halls in Mpumalanga operating entirely on the EBT format and platform of the Bingo game. A further 8 Bingo licences have been issued by the regulator and the license holders are preparing for the rollout of further Bingo sites. Between these two Bingo halls about 350 EBT's are operated. The MGB has, to date approved a further 160 EBT themes which can thus be readily rolled out on the Bingo floors should this be desirable to the operators (MGB Annual Report, 2016). Other POs that were seemingly apprehensive of the product have also entered the market with their own design or as providers of complimentary Bingo products, e.g. CMS. By all accounts, the product appears to be successful and has the wherewithal to independently sustain the Bingo sector of the gambling industry.

6.2   The model regulator's contribution

From the empirical observations, finding and the discussion thereof, four significant contributory acts attributable to the regulator which have somewhat enhanced the product's prospects of success in the market are identified. There could be many others, but the following four have largely stood out and they are:

6.2.1   *Contribution 1:* Creating an enabling context

The importance of the context created by the regulator that enabled further knowledge development about the model product is easy to overlook. This is so mainly due to the inclusion of many other parties into the knowledge creation process. As observed in the description of the product, and the discussions, knowledge development is now perpetual and has brought in many other spheres of society. Regulators everywhere in South Africa where they are confronted by the submission of the product continue to be the centre of knowledge creation and the platform through which the discussions occur.

For example, public consultations, policy positions, and litigation processes are all channelled through the relevant regulator. As a legislative requirement, the relevant regulator must consider all such submissions, defend, or support the court actions. These are all knowledge intensive endeavours. The internal regulator context must be that of readiness to receive, analyse and be conversant in a meaningful manner about the product using different and appropriate language. To the public and political principals, the regulator must be able to

converse in lay language, whilst a more technically accurate tone is required for industry participants. The external context, from the regulator requires factors such as, accessibility, fairness, integrity, and transparency amongst others.

Failure to create and provide a knowledge development friendly context may be regarded as failure to execute the core and mandatory strategic commitments, such as "providing advice to government", and protecting the public against unsuitable products. Thence, the regulator cannot justify its existence.

6.2.2   *Contribution 2:* Clarifying the codification conundrum

From Boisot's hypotheses, we know the importance and benefits of high product codification particularly the savings in data consumption, and processing, hence time. Therefore, any clarity and simplification of the coding of the product is desirable and hugely beneficial to innovators. For instance, if an adequate codification scheme existed in 2006 when the product was first introduced to the gambling markets in South Africa, the product would have likely been approved earlier and diffused to more provinces quicker.

However, the product only served to increase the complexity of the codification task since it did not fit into any of the existing coding schemes. To accommodate it, a new gambling and product sub-category had to be created by the regulator within the existing regulatory framework.

To maintain the sought-after Bingo theme desired by the PO, the new sub-category was created under the Bingo sector. As such, the existing categories were modified to accommodate it. Without the category modification, the product itself had to be adapted to comply and fit into the pre-established gambling industry categories. Re-adapting the product to existing codification schemes was the less favourable option, therefore the existing Bingo category was categorised into "traditional" and "EBT", whilst previously only one category of Bingo existed. Because of the new codification scheme introduced by the regulator, Bingo halls now consist of traditional and EBT Bingo products.

By its approval of the product in 2009, the public regulator also accepted and endorsed the codification schemes of the EBT proposed by the PO despite the existent legislative shortcomings. Furthermore, since a new coding scheme was created in the broad gambling categories it accommodated the EBT within the existing codification schemes, particularly that of Bingo thus creating an avenue for this product to compete. The regulator's actions effectively sealed the fate of the product in the gambling industry in a hugely positive way.

As noted earlier, the regulator's view carries the moral and legislative authority on all matters relating to gambling, hence products endorsed by it are viewed favourably by the industry and the public. Firstly, such products are viewed as safe, fair, and secondly carry the moral license of being legal. By saying "this product is a Bingo game, therefore can be used in Bingo halls" the codification conundrum was settled at once, hence the product is now operated in Bingo halls. Boisot (1998, p.45) notes that once a product has been codified, a "lock in effect" that is difficult to reverse over time is thus created.

Boisot (1998, p.45) notes that, the capability of a firm in persuading the market to accept its way of structuring the world and the its way of categorising products likely determines the fate of such products in the market, since once the firms proposed codification scheme is accepted, it becomes the standard with an "irreversible lock-in effect".

Despite the absence of direct legislative and regulatory appropriate fit or category of the product, the manufacturer proposed that it will snuggly fit into the Bingo category. Hence, by its approval of the product for use in Bingo halls, the regulator agreed with the manufacturer, thereby validating its claim about the appropriate coding of the product. Following, the approval of the product, the manufacturer was then able to market it as approved by the regulator thus paving the way for the EBT to move into the diffusion area of Boisot's I-space.

6.2.3   *Contribution 3:* Negative corrective feedback

From the empirical data presented, particularly the response of the PO after the regulator provided its reasons for declining the approval of the product, it will be naïve or perhaps disingenuous to claim or assume that PO did not envisage the rejection of the product by the regulator. Earlier empirical evidence shows that the PO has vast experience in designing gambling products and has perpetually over the years interacted with regulators. As such, the PO is aware of the typical diffusion barriers to products, particularly novel ones such as the EBT.

The available legislated gambling sectors are common cause in the industry, therefore the PO was, or ought to have been aware that its product did not exactly fit into any of these of these categories. It is also common cause that such products must be tested against the applicable standards and the PO was aware that such standards did not exist for this particular product. With all this knowledge and experience in mind, why then does the PO continue with submission of a product which, given the requirements, is most likely to be rejected than approved? Three theses can be advanced from the PO's insistence on submitting the product despite its obvious and fatal shortcomings:

i)   Although a tangible product was in place, the PO did not envisage it as a complete product, hence the submission was part of its development stage, i.e. market testing to obtain vital knowledge before the product is rolled out.

ii) Secondly, the PO subscribed to the notion that, the regulator is indeed incompetent and lacks the technical capacity to evaluate such a product, therefore it will likely approve the diffusion in which case the PO has designed the "perfect product".

iii) Thirdly, the regulator is indeed competent and likely to conduct a thorough evaluation of the product in which case it provides useful feedback that will improve the overall product and ensure smooth diffusion in other provinces.

The three propositions advanced here-above all point towards, a need for further knowledge development by the PO, hence the conservative diffusion approach to a single rather than the conventional multi-jurisdictional submissions of the product. Seemingly, the PO's strategy was, if the product is approved, then diffusion is proceeded with without delay. Alternatively, if the product is not approved, reasons for its failure will be solicited and where possible and sensible be co-opted in the administrative and/or technical design of the product. Thirdly, where the reasons for rejection are not sensible from a financial and design (administrative and technical), the PO will contest and attempt to convince the regulator to accept its propositions thereby reducing product design costs and expediting the diffusion process.

On the surface, declining the approval of the product by the regulator was a setback to the PO and the product itself, however, important knowledge about it which later proved to be useful for its survival was gleaned. Even though the product was presented as a Bingo conduit, the PO was tacitly asking the regulator pertinent strategic questions, for instance whether, such a product will be acceptable for use in other markets such as casinos. Secondly, will the casino standard nonetheless be acceptable to test it or whether a specific standard must be created for this product. Thirdly, the PO also tested the regulator's attitude towards interoperability testing of the product against existing products and which of such products the regulator will require the EBT to be tested against. Such knowledge ultimately determines the POs design scope, hence a significant event on time and cost of design.

Since gambling is a regulated environment, the regulator presents a cost effective and faster avenue for sourcing the required knowledge and no additional expense is incurred. By submitting the product, for evaluation whilst knowing the regulatory challenges it is likely to face, the PO effectively and tacitly set the regulator into the path of knowledge exploration.

The PO proposed a codification scheme, in the form of an applicable sector and further proposed a technical testing criterion in the form casino standards and a regulatory framework when it insisted that the product can be regulated through existing legislation. To respond to this submission, the regulator could live up to the "incompetence tag" by simply accepting the POs proposals on the product or embark on actual knowledge development to provide informed resolutions. Either choice is beneficial to the PO and to the product in one way or another.

When the regulator replied to the PO after extensive research and analysis of the product, it answered the tacit questions of codification, standards for testing and interoperability requirements. In this regard, the POs proposed codification scheme was not accepted in the regulator's jurisdiction, the standards for testing were insufficient and inappropriate and interoperability testing against an appropriately approved monitoring system was compulsory. With this knowledge, the PO can thus weigh whether the product can be reasonably modified to accommodate these requirements, try to convince the regulators to accept it with the shortcomings or create an avenue to correct such.

Since the regulator in its analysis and research of the product consulted widely within other gambling jurisdictions in South Africa and abroad, their reasons for declining approval for the product were representative of the likely attitudes of other potential stakeholders regarding same. Therefore, the POs strategic posture regarding the product was influenced by the knowledge development endeavours of the regulator. From such information, the PO could thus factually assess time and cost of diffusion. Furthermore, by eliminating the diffusion inhibitors identified and pointed by the regulator the PO can anticipate these and address them before approaching other regulators. The solicitation of a regulator's response regarding this product allowed a codification, abstraction, and diffusion strategies to suggest themselves (Boisot; 1998, p.45).

After all the diffusion barriers have been eliminated, hence approval from the product can be thus be marketed to operators and the operators will not be sceptical about its operations since the relevant regulator has approved it for use. Unwittingly, the regulator has contributed value into the product and rendered such more marketable. Ultimately, the regulator does not, and is not entitled to claim any credit for the improved prospects of success for the product.

6.2.4   *Contribution 4:* Creation of a new testing, certification, and approval standard

Notwithstanding the new codification scheme and the creation of a new category of gaming within the Bingo halls, the diffusion inhibiting variables such as a lack of legislative framework and the appropriate technical standards remained. The remainder of these barriers was a creation of the regulator when it rejected the proposed codification and testing schemes by the PO in its submissions. As such the options at the regulator's disposal were binary, such that, it could one, totally reject the product based on lack of appropriate legislative framework and testing standard, or create such a standard and framework and enable the introduction of innovative products. Choosing either of these options is solely the prerogative of the regulator guided by its policy postures and whilst POs can make inputs on these, they are not empowered to make the decision.

If the regulator had opted the total rejection route, which it was legally entitled to, this would have been a fatal blow to the diffusion of the product. However, the regulator committed resources into the development of the appropriate platforms to encourage the diffusion of the product. As such, a completely new standard and a general legislative framework governing the testing, certification, approval, and operation of the EBT had to be created. These frameworks required a great deal of knowledge exploration on the side of the regulator. For example, the creation of new technical standard is complex and arduous process which requires research and collaboration amongst the industry players and the POs.

Regulators in this regard, facilitated and ensured the availability of a new technical standard A (SABS, 2009) for the testing EBT products and other server-based gaming product that may be introduced in future. The promulgation of a standard for server based gambling systems has, simplified the approach to such products in the gambling market and provided the necessary blue print for all regulators, POs and operators.

According to Boisot (1998, p.78) the utility of an information good is partly a function of its degree of codification. Therefore, by resolving the codification concerns associated with the product through the introduction of a new standard that is applicable to all gaming jurisdictions in the country, the regulator improved the utility of the product since it could be now be generalised in all provinces.

Furthermore, the standard ensured well-articulated documentation and descriptions of the product, standardised its designs and provided information to POs on what would be the acceptable technical operations of the product. Given the clarity provided by the standards,

more provinces could thus consider approval of the product and new Bingo operators could emerge.

6.3   Chapter conclusion

The four key contributions of the regulator from a knowledge development perspective were magnified in this chapter and individually analysed. These are; the creation of a context that enables knowledge development to thrive; clarification of the codification poser, provision of negative corrective feedback to the manufacturer, and the creation of a previously non-existent standard for testing, certification and approval of equipment of a similar nature.

The chapter highlighted the importance of these contributions by the regulator particularly in light of the products' current position, i.e. the creation of value and competitive advantage for its owners, the establishment of a new and sustainable gambling market, the creation of jobs and the lowering of the entry barriers for new entrants. It is clear from this chapter, the regulator laid a solid foundation for future products similar to the EBT to enter the market and to thrive.

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Chapter 7: Implications for knowledge management

7.1   Epilogue

At the very outset of this thesis, the EBT case emphasised that products that yield competitive advantage come about as a result of multiple inputs from diverse stakeholders with differing interests. The diversity of the stakeholders ubiquitously includes regulations and regulators. From a knowledge development and innovation perspective, the multiplicity of views in the development of products, including those of regulators is largely viewed as either a constrain or stimulant for knowledge development for innovation.

The theoretical basis of regulation and knowledge development on which the thesis is premised was presented in Chapter 2, where dichotomous schools of thought i.e. CET, and the Porter Hypothesis were introduced. The CET perspective aligns with the constrain perspective of regulation whilst, the Porter Hypothesis regards it as a stimulant of knowledge development, hence innovation. Still in Chapter 2, the thesis explained in detail and distinguished the concepts of data, information, and knowledge and provided a theoretical basis of these concepts based on Boisot (1998) theories of learning which are Neoclassical, and Schumpeterian learning perspectives. In Chapter 2, Boisot's I-space concept was also introduced to show the processes leading to the diffusion of products from a theoretical perspective. These theories were instrumental in showing the origins of the EBT product and its location in Boisot's I-space analytical framework and they featured prominently in the analysis of the regulators' contribution as discussed in Chapter 5 of the thesis.

Chapter 2 revealed sharply the scarcity in knowledge management studies and highlighted the slant of research towards private sector problems and the limited research in the public sector, particularly from a regulatory standpoint. Accordingly, Chapter 2 attested that KM theories of the private are applied in the private sector even when they are not entirely applicable. Due to the underdevelopment and lack of sufficient exploration of KM theories for the public sector, the incessant view that regulation and hence, public regulators constrain knowledge development for innovation thus remains empirically untested.

The thesis used the regulated gambling industry and particularly the regulator in Mpumalanga to draw the empirical observations and analysis. The gambling industry was thus introduced in Chapter 3 and its networks of collaboration and knowledge development defined to determine

whether such encourage or constrain knowledge development and how they do that. In Chapter 3 the multiple variables of collaboration including the stakeholders in the product development process were isolated and shown to include manufacturers, test laboratories, certifying authorities, regulators and the operators of gambling equipment.

On the surface of the analysis, it appeared that the plurality of views in the product as imposed by regulation indeed stifled knowledge development and constrained innovation, hence aligning with the CET. However, this was not the absolute position since it was highlighted further in Chapter 3 that the views on regulation, knowledge development and innovation, largely depend on the side of the innovation spectrum these are gleaned and presented. For instance, Chapter 3 notes that manufacturers of products are eager to diffuse, hence lean towards a preference of minimal layers of evaluation. Whereas, regulators support multiple points of evaluation to build redundancy in the processes, hence developing maximum knowledge about the product which aids further innovation. The analysis in Chapter 3 showed the PO's contribution to be bringing the basic concept and framework of the product, whilst the regulators brought the public interest perspective into the products features and attributes.

The submissions in the thesis up to, and including Chapter 3; remained speculative in the absence of empirical observations to support them. As such, the empirical perspective was presented in Chapter 4 where empirical observations were covered from the public regulator. The empirical observations at the public regulator largely rebuffed the constraint view of regulation to knowledge development and innovation as proffered by CET, instead, it supported the Porter's Hypothesis that, if formulated correctly, regulation aids the process. It was further found and shown that the orthodox view that public regulators do not ordinarily create knowledge but instead exploit it, is not always correct since the empirical evidence shows various processes of generating new knowledge. Such knowledge was also found to be shared with the manufacturers of the product and incorporated into the products as evidenced by the four key contributions by the regulator which later found themselves in the product attributes.

The regulator's processes and its resultant contribution were also found to have a sustainable impact on an industry-wide scale and set the tone for new entrants. The regulator was encouraging and supportive to its employees in respect of further study and continuous development, which is a key requirement for knowledge work and expert contributions. From the interviews conducted, the respondents attested to a high degree of autonomy and they

assertively painted strong sympathies towards making a contribution into products submitted to them for evaluation, instead of passively accepting submissions by the manufacturers.

Notwithstanding the pro-knowledge development observations at the regulator, certain attitudes and practices that may hinder such were observable. These were mainly related to the formal power dynamics within the evaluation process of new products such as the EBT, in that, the levels with the most formal power made the least contribution of technical knowledge into the product, and vice versa. This phenomenon is demonstrated in Figure 12. As such, due to the poor technical understanding of the product, the powerful executives tend to misinterpret, misunderstand, and, or misrepresent technical findings and submissions by the lower level employees at operation and product level. This thus perpetuates the constraint and incompetence view (CET) of regulators since their contribution is ineptly presented by technically illiterate executives.

The preceding Chapters of the thesis focused mainly on the analysis of the empirical observations. A major analytical input in Chapter 5 was the classification of the regulator as a PSF-MPB based on its organisation along hierarchical lines. In Chapter 5 regulators knowledge positioning, issues of context and collaboration were analysed and found to favourably align the public regulator with knowledge development for innovation.

The four key contributions of the regulator are separated from the rest of the processes and other factors and individually analysed. All this led to a conclusion that the regulator cannot and should not be discounted as a mere consumer on knowledge, lest its key contributions will be missed and, or, misdiagnosed.

This chapter therefore, respond directly to the questions posed by the thesis at the outset – which are; whether public regulators make a knowledge contribution or stifle it; and, any what is it that they contribute, and if they are consciously structured to support knowledge development. But more broadly, the question whether regulation supports or stifles innovation are summarised in this chapter. The implications of the regulator's, and regulation's posture for knowledge management, for the regulated gambling industry and general policy questions are considered herein.

7.2   Knowledge contribution, development, and innovation under regulation

The regulated environment is a rich area of exploration and contestation of innovative ideas. The legislated provisions that establish the public regulator place a knowledge development burden on it which it must nurture on a perpetual basis. As per the definition of a public regulator espoused in this thesis, the establishment of public regulators is premised on the need for specialisation and expertise on a narrow area of authority. In the main, these are areas that are complex, yet require rapid and continuous implementation of public authority. In the first instance, the regulator cannot create regulatory requirements that it does not understand itself and cannot provide the rationale for such requirements. As such, the regulatory requirements that the regulated industry is subjected to, must be well researched and tested for need, feasibility and rationality before promulgation. It is hence common cause for regulatory bills to land in courts for arbitration.

As a generic process, applicable in the legislative framework of South Africa, new legislation is subjected to public comments and exposed to brutal scrutiny, hence it is incumbent on the originators of such legislation to ensure their rationality. The process of soliciting public input is a form of collaboration and knowledge creation initiated by the regulator in most instances. It pools together inputs and review from various perspective comprised of industry players and any other interested party.

Furthermore, once a regulation is promulgated it remains incumbent on the public regulator to ensure compliance with it by the regulated firms. When the regulator finds non-compliant behaviours in the industry, it must further ensure the existence of a punitive or corrective system, which also dictates a requirement for a specified type of knowledge. Therefore, a culture of perpetual knowledge development must be embedded in the regulator's processes, and its employees must subscribe to such. This was found to be the case in the regulator considered in this thesis.

As the expert in the field, the regulator is also found to serve as the primary and central repository of knowledge and historical information concerning the industry it regulates. As such it is a reference point for all regulated firms in the market, potential entrants, government, and scholars. This thus requires it to ensure high codification of knowledge and information concerning the industry. However, the regulator cannot codify that which it has not created, as such it must create the knowledge through processes of analysis, experimentation research. Therefore, irrespective of the origin – data, its analysis, preservation, retrieval, and presentation

are the primary currency of the regulatory agency, and must be treated as such. It is such data and the processes highlighted herein that will lead the creation and availability of the knowledge required by society from a regulator.

Whilst knowledge is currently created on a continuous basis, there is a general lack of appreciation of the processes, the costs, and the value of this contribution by the regulator. As such, it is unable to quantify and communicate the value of it to the private sector, and society. This therefore continues to peddle the view that the regulator's work is an unnecessary nuisance with no real contribution to products and society. Observations from the interviews have somewhat highlighted possible factors that perpetuate the negative stereotypes about regulators, in that it does not always use the relevant and appropriately skilled people to represent its work. Therefore, they come across as incoherent and incompetent. Accordingly, it is of critical importance that the regulator is able to attract, retain and develop professionals from a diversity of relevant fields. But most critically such people must be provided the autonomy and platform to represent the work of the regulator.

I therefore, propose that where regulators are found to be incompetent, stifling, and costly to the innovation processes, such malfunction stems from a poor understanding, hence poor implementation of the regulatory mandate. Further issues, could be poorly defined objectives for regulating the industry. However, in the long run the legislated requirements will tend to correct the malfunctions, that is only if the objective and purpose of regulation was properly defined in the regulations. As a system of regulating industry behaviour, I argue based on the empirical evidence in this thesis, that knowledge development for innovation is embedded in the processes defined in legislation and even on the process of creating legislation itself.

It thus cannot be subverted without tampering with the legislated processes and requirements in regulations. Therefore, inferior performance, regulatory capture and other inhibitors of innovation and knowledge development which are magnified by economic literature, are a function of the people implementing the regulations rather than the regulations. Naturally, organisations their practices, and regulations remain longer than the people in them, therefore at some point in the life of the organisation the innovation and knowledge development will be prioritised.

I therefore proffer four cyclical dimensions of knowledge development for innovation in a regulated environment based on the empirical evidence which are learning, adapting, innovation and compliance.

Based on the EBT product considered, regulation and the regulator have shown themselves to be positive aspects of knowledge development and innovation phenomenon. The EBT case shows that regulation and the regulators, resolved a highly complicated codification conundrum and created a context and climate of collaboration, thereby propelling the product deeper into the diffusion area of Boisot's I-space.

7.3   Public and private sector knowledge management research

As shown in the literature review anchor studies in knowledge development hence innovation, have tended to focus on the efforts of the private sector (e.g., Nonaka (1991), Nonaka and Takeuchi (1995), Szulanski (1996), Wiig (1993), and much later, Armistead & Meakins (2002) and Newell et. al. (2009). This approach has thus thrust the private sector as the singular most important driver of innovation and knowledge development across all sectors. As result of this, research, and conclusions on knowledge development for innovation has tended to reduce the public sector organisations to cameo contributors in this area.

Through the knowledge contribution of the public sector, particularly the public regulator in regard, to the EBT, the study has succeeded in showing that, whilst the private sector is critical in knowledge development and innovation, public sector organisations are critical in further development of products and their fate post diffusion for general consumption. This finding thus supported and gave credence to the Schumpeter theory of learning espoused in Boisot (1998) that products are hypothesis and subject to further development. However, often further development is best served by the next innovating firm which views the product from a perspective vastly different from that of the initiator. For knowledge work and knowledge management, this thesis has highlighted that the public sector is, just like the private sector, is a rich resource for new perspectives on the management of knowledge for innovation.

Furthermore, the study has emphasised and aligned itself with literature on the subject, particularly the school of thought that views context and specificity as crucial in the conclusions and assumptions about knowledge development. As such, whilst the study recommends that knowledge management research should also focus on public organisations, it also suggest that the research must be done within a narrow public-sector context e.g. agriculture, manufacturing, or manufacturing. Such a focus could in a small way perhaps reshape knowledge management theory and organisational practices and provide a more balanced view on the subject.

Within the right context, and given the required support, resources, and appropriately skilled personnel at its disposal, regulation and regulators can also assist knowledge development and

innovation which augurs well economic and general development. As a knowledge development and innovation resource, regulation and regulators must be embraced, and as practically as possible, relieved from the political burdens and other ills besieging them. Furthermore, when they are being setup and configured, knowledge development and innovation must be amongst the main issues of consideration. The capacity to investigate, analyse, collaborate and report on issues relevant to a narrow area of focus must be built in their structures and perpetually monitored. Whilst their focus on curbing recalcitrant industry behaviour remains important, knowledge development and innovation must be advanced as elements that support such functions hence embedded in the practices.

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Appendix 1 – Research Instrument

SECTION A - KNOWLEDGE WORK AND THE KNOWLEDGE WORKER (INTERVIEW)

In order for the regulator to make a knowledge contribution into innovation its activities must be characterised by an emphasis on theoretical knowledge, creativity and the use of analytical and social skills". As such, this section is aimed at determining the extent of knowledge and whether the employees are knowledge workers;

1.   Describe your current level of education, skills and experience?

2.   What is your current position at the regulator?

3.   How long have you held this position?

4.   Please explain the type of training, skills and experience required in order to successfully do this kind of work?

  4.1 Would you consider these esoteric skills? If so, why?

  4.2 Do you consider yourself an expert/specialist in this field? Please elaborate on your response?

5. Please explain your degree of autonomy and decision making in regard to the execution of your work; for example; explain how the planning, execution and reporting process is structured,

     5.1 Also, describe the level and extent of involvement of your superior(s) in such processes;

     5.2 Describe the applicable decision making processes and layers;

     5.3 Give examples of decisions that you are authorised to take and implement and those that require your superiors' approval;

SECTION B - ORGANISATIONAL CONTEXT (DOCUMENT REVIEW/INTERVIEW)

1.   Organisation structure

Describe the organisational structure in terms of;

1.	Levels of hierarchy	
2.	Work processes	
3.	Rules, policies and procedures	
4.	Supervision and control	
5.	Decision making	
6.	Co-ordination	
7.	Form	

2.   Training and development

Describe the applicable professional development programs of the organisation; i.e. how does the organisation stay abreast with developments in the industry in terms of the following:

1.	Staff training	
2.	Educational policies/ bursaries etc.	
3.	Incentives for completed qualifications	
4.	Leave	
5.	Professional affiliations	
6.	Conferences	

3.   Knowledge management systems (document reviews)

Describe the availability and access to the following ICT systems in the organisation.

1.	Internet	
2.	Intranet	
3.	e-mails	
4.	Social media access	
5.	Wi-fi	
6.	Knowledge directories/repositories	
7	Telephone access	
8	Remote access	
9.	Other	

SECTION C - REQUIREMENTS FOR KNOWLEDGE WORK (INTERVIEWS)

1.   Knowledge processes

1.1   Describe in detail what your work entails?

1.2   Please explain the extent to which your work entails the creation of new knowledge?

1.3   Generally, what processes do you follow in your department in the creation of new knowledge;

1.4   In your view, is the creation of new knowledge important in the work that you do?

      1.4.1   If it is, why is it so and how often do you have to create new knowledge?

1.5   Does your work generally require the conduct of experiments and tests? Please elaborate

2.   Knowledge projects

    2.1   To what extent is your work structured as project work, i.e. work with a set start and end time. Please elaborate your response;

    2.2   Would you say the EBT exhibited elements of a project? If it did, please explain the kind of project work that involved in the project;

3.   Knowledge creation and EBT

    3.1   Please describe in detail all the processes that were embarked upon when the EBT was received by your organisation.

    3.2   In regard to the EBT, did you conduct any experiments and/or tests as part of the evaluation for approval of the product?

3.3   Please explain your experiments and/or tests; highlighting amongst other things the basis and the purposes of such;

_____

3.4   Please explain your role and contribution in the design of the experiments and/or test of the EBT product.

_____

3.5   How did you know the kinds and scope of experiment and/or test to be conducted on the product?

_____

3.6   Are such experiments and/tests standard in evaluations of all products or these were designed specifically for the EBT?

_____

4.   Collaboration, sharing and EBT

4.1   In general, to what extent does your work require discussion with other people e.g. for the purposes of explanation; to obtain further information; presentation of new ideas etc. please elaborate your response as much as possible;

_____

4.2   In regard to the EBT, were you required or was it necessary to discuss the product with other parties to solicit their inputs and/or observations about it?

   If yes to 4.2 above;

   i.   Please describe who were these parties, e.g. other regulators, colleagues within the organisation etc.;

   _____

   ii.   Did you receive any input from these parties? If so did you find their input particularly that of other public regulators in the gambling industry valuable;

   _____

   iii. Did you incorporate such input in your evaluation of the EBT product for use in your province?

   _____

4.3   How often do collaborate and share information with regulators on products such as the EBT?

   _____

4.4   Would you say collaboration was an important part of your work in regard to the EBT?

   _____

5.   Contribution into the EBT product

5.1   In your view did your experiments, tests and/or evaluations identify any issues of which the initiator was not aware? If yes, please elaborate on these.

5.2   In your view did your experiments, tests and/or evaluations identify any issues of concern/improvement on the EBT product.

If no, to 5.2 above;

i)   Please elaborate on why do you think this was the case;

ii)   What is your comment on the tests, experiment and evaluation (i.e. do you believe that such were sufficient in identifying the important features of the product?)

If yes to 5.2 above;

iii)   please elaborate on the issues identified;

iv)   If yes, were these issues/concern or improvement communicated to the initiator/submitter of the EBT product?

5.3   In your observation, did the initiator address any of the issues of concern and change the EBT product in accordance to these. Please explain and elaborate on the changes made on the product; in the following aspects:

i)   Technical changes, e.g. size, shape, colours, features, functionality and any other visible and tangible changes;

ii)   Administratively, e.g. classification, applicable legislative framework, applicable gambling sector, operational requirements, future tests etc.

5.4   Looking at the EBT now (2016), what would you say are the major technical and administrative changes on the product that are attributable to the contribution regulators and their knowledge management efforts?

5.5 Regulators are generally regarded as inhibitors of innovations due to their bureaucratic postures and perceive lack of knowledge and interest in innovation. What are your views regarding this statement?

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6. EBT related document review

The document review will focus on the following:

1. Correspondence between regulator and initiator;
2. Internal reports produced by the regulator in relation to the EBT product;
3. Developments in applicable legislation;
4. Technical requirements regarding EBT; and
5. Court cases/judgements between public regulators, initiators and other interested parties.