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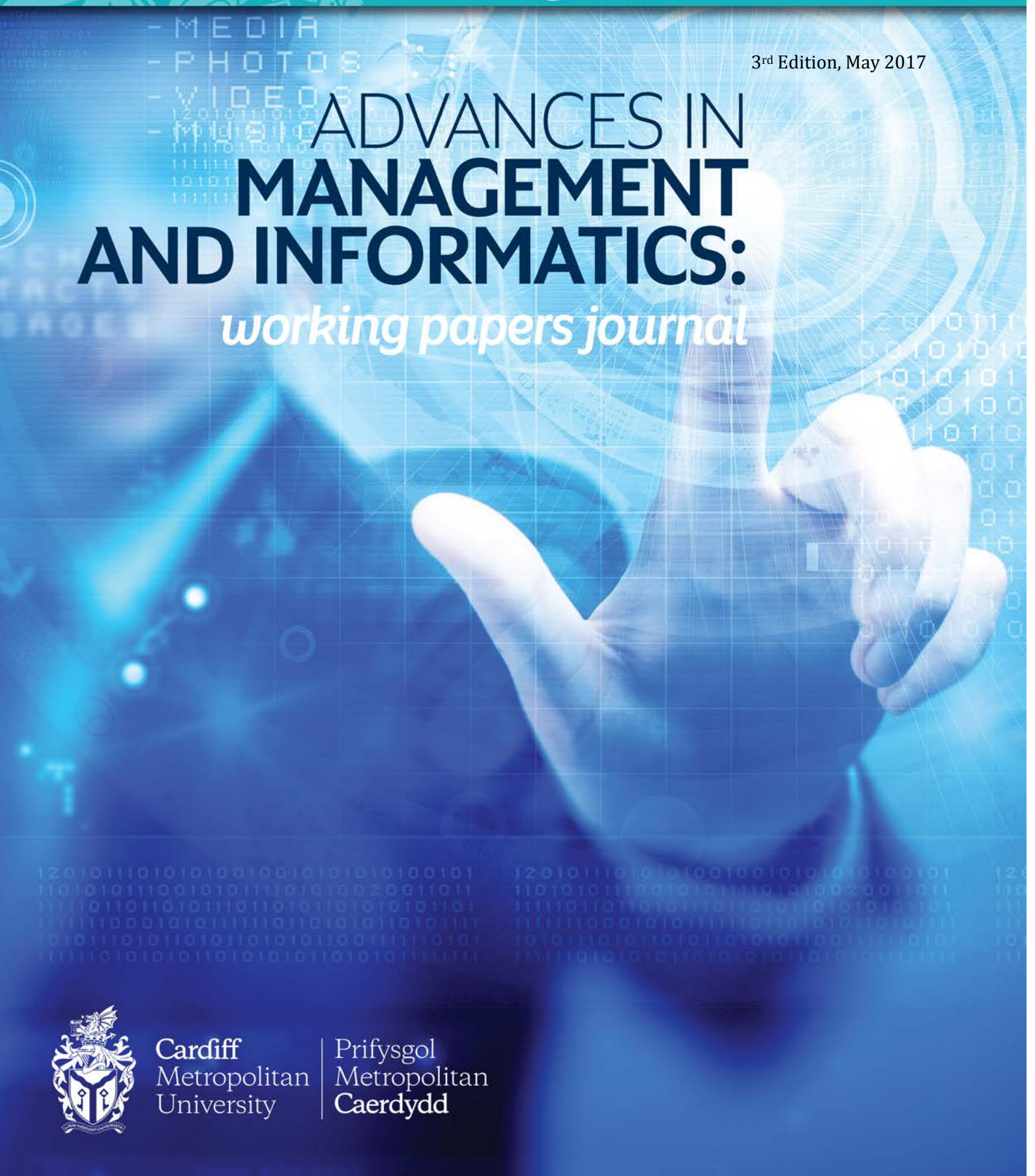

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ADVANCES IN MANAGEMENT AND INFORMATICS:

working papers journal

Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd

ADVANCES IN MANAGEMENT AND INFORMATICS:
working papers journal

Aims and Scope

Welcome to the third edition of the Advances in Management and Informatics (AMI) Journal for the 2016/17 academic year. This issue provides a selection of topics that should be of interest to members of the School.

Advances in Management and Informatics Systems is a quarterly journal that allows members of Cardiff School of Management to contribute topics of interest, ranging from embryonic ideas through to work that is nearing completion. Some of the ideas presented to the editor have since been published, and some are undergoing further research. . We would like to stress that as this is a working paper journal, publication here does not preclude the authors from publishing their work elsewhere.

We welcome submissions and comments to the address AMISjournal@cardiffmet.ac.uk, a template can be found in the CSM webpage, http://www.cardiffmet.ac.uk/management/Pages/default.aspx

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Special thanks to Dr Ana Calderon the previous Editor of the Journal

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PROJECTIVE TECHNIQUE METHODOLOGY FOR QUALITATIVE DATE COLLECTION: A USEFUL TOOL FOR UNDERGRADUATES, MASTERS STUDENTS AND RESEARCHERS IN HOSPITALITY, TOURISM AND EVENTS-A WORKING PAPER

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ABSTRACT

This is a case study reflecting on the researchers experiences when completing a PhD in 2014. One of the key contributions to knowledge was the use of Projective Technique methodology to collect rich qualitative data.

This study will explain how projective technique was used and how the tool evolved as a result of previous semi-structured interviews and focus groups. The model used demonstrates how the interviewees interacted and responded with examples of how the model stimulated interesting and informative data including recording of the verbal responses and photographs of the results of their input to the model.

The aim of this research is to encourage the use of projective technique methodology for primary research for PhD's, Masters and undergraduate dissertations. The inter-active method can make semi-structured interviews more dynamic and interesting. Undergraduate students find the method very structured and less dry and monotonous than one to one interviews as it makes the participant really think how to respond.

Qualitative research was undertaken with the interviewees used on the PhD and with undergraduates who are currently using the method for on-going undergraduate dissertations. The results are very positive to date from both participant interviewees and undergraduates using projective technique as one of their research tools. The case study model is used as a template example to demonstrate how individual models can be customised to meet individual aims and objectives.

The findings indicate the potential of using projective technique methodology to collect rich qualitative data in an interesting inter-active way giving photographic evidence of the findings. The model used was successful and the interviewees considered this more useful and stimulating than one to one semi-structured interviews. Future possibilities of creating projective technique models that can be shared as an app on I pads, being used to administer and store the models and the data collected is both innovative and practical.

Key words: Hospitality, Methodology, Projective technique, PhD, Undergraduate dissertations, Masters dissertations

INTRODUCTION

This research paper evolved as a result of the completion of a PhD in 2014. This article begins with a brief overview of the PhD study. Three key themes are identified and summarised in the introduction. What is projective technique and how can it be of value to PhD, Masters and Undergraduate students, an explanation of the model used in the PhD and how this can be adapted to other conceptual frameworks and models, and concludes stating the aims of this research in progress.

The PhD is a constructionist study which explores the perspectives of key stakeholders on drivers for the evolving UK higher education hospitality curriculum, and establishes the extent that opposing vocational and academic forces shape the HE hospitality curriculum. One of the techniques used was projective technique methodology.

WHAT IS PROJECTIVE TECHNIQUE METHODOLOGY?

This type of interview originated with clinical psychologists who used enabling and projective techniques as an aid to communication and discussion (Catterall *et al*. 2000). Boddy (2005) discusses the qualities of both projective and enabling techniques and makes the distinction between the two. Enabling techniques focus on getting people to talk about themselves whereas projective techniques seek to understand respondent's views on a given phenomenon. Lilenfield *et al*. (2000) identify five groupings; associative, construction, completion, choice ordering and expressive. The author found this method very helpful and constructive as an aid to qualitative semi-structured interviews and focus groups

The Projective technique model used in the PhD

Data for the PhD was collected in three phases. Phase three involved a projective technique to analyse the operational forces shaping the hospitality curriculum. The model consisted of three key themes, DEEPLIST for envisioning remote environmental issues and future trends (Finlay 2000), a Stakeholder identification and Salience model (Mitchell *et al*. 1997) and thirdly the researcher identified key issues for discussion. The three key themes were presented as a model and the interviewees gave verbal feedback and were able to interact with the model.

The aim of the paper

The aim of the paper is to demonstrate how projective technique was used; to present the views and opinions of the respondents who participated in this style of methodology and most importantly to explore the potential value for PhD, Masters and Undergraduate students of taking the concept and idea to customise to individual research questions, therefore creating a structured and interactive data collection method to stimulate interviewee insights, view and opinions that can be captured both verbally and visually.

LITERATURE REVIEW

The literature critically reflects upon and evaluates on the key areas identified in the introduction, thus; a summary of the PhD literature and the rationale for using projective technique to gather rich qualitative data, an explanation of how the model was developed, concludes with a rationale and how the idea and concept can be adapted to primary research questions.

A SUMMARY OF THE PHD

The title of the PhD is 'A model of the drivers for hospitality management curriculum in the United Kingdom' the thesis was completed in 2014. The literature review focuses on three areas: the hospitality management curriculum; remote environmental influences and future trends; stakeholders and power culminating in a conceptual framework showing three dimensions of power that shape the HE hospitality curriculum and identifying mechanisms through which stakeholders operate.

DEFINITION OF THE HOSPITALITY MANAGEMENT CURRICULUM

The Higher Education Funding Council for England (HEFCE) (1998:2) defines hospitality management as 'the management of food, beverages and/or accommodation in a service context'. The definition is crisp and concise but has limitations. The literature review discusses the on-going debates surrounding a suitable definition that incorporates more than just the vocational preparation of students to the commercial hospitality industry but also includes the opportunity to broaden the curriculum to include hospitality studies into hospitableness and understanding host-guest relationships. The early curriculum framework designed by Nailon (1981), the use of 'hospitality curriculum space' (Dredge *et al*. 2012:2167), stakeholder influences (Airey and Tribe 2000) and the Social Lens model (Lashley *et al*. 2007) are all reviewed and analysed. For the purpose of this thesis, educational and environmental influences on the curriculum have been considered separately. The literature review demonstrates the weaknesses of the above definition and elaborates on the much broader scope involved in hospitality management curriculum and the environmental influences that help to shape it.

THE THREE KEY THEMES

The three key areas are

- Educational influences on the hospitality management curriculum
- The remote environment and future trends
- Stakeholders power and the hospitality management curriculum

Educational influences within the curriculum that the academics need to address were developed. Eight key research themes were chosen by the author; the evolution of the hospitality management curriculum; vocationally orientated students and active learning styles; the dominance of food and beverage operations in the curriculum; work-based learning; funding pressures to devocationalise the hospitality management curriculum; entry routes and requirements; the international agenda and overseas graduates and hospitality management and the Higher Education Academy (HEA). These curriculum space issues were put into figure 1:

Figure 1. Educational influences

THE REMOTE ENVIRONMENT AND FUTURE TRENDS

This section considered the wider external environment, referred to by Finlay (2000:192) as the 'remote environment', which will shape the future of all curriculum design. For the purpose of this thesis remote environmental influences are the complex, wider, contextual issues surrounding and influencing the hospitality management curriculum. These are important to consider when looking at the long-term trends that affect all curricula and impact on the vocational versus academic debate. Although educational activities underpinning curriculum development are the main concern, it is important to be aware of the remote environmental influences, such as significant trends and events that will change the landscape. To assess and predict the future remote environmental issues the researcher will use the DEEPLIST model devised by Professor Finlay to highlight potential relevant contextual factors covered by DEEPLIST (demographic, economic, ecological, political, legal, informational, social, and technological). Major changes, even in the remote environment, can seriously impact on educational factors. 'Social changes induce changes in market conditions and technological change provokes the emergence of substitute [curriculum] offers' (Finlay 2000:193). Figure 2 was created to use as part of the projective model

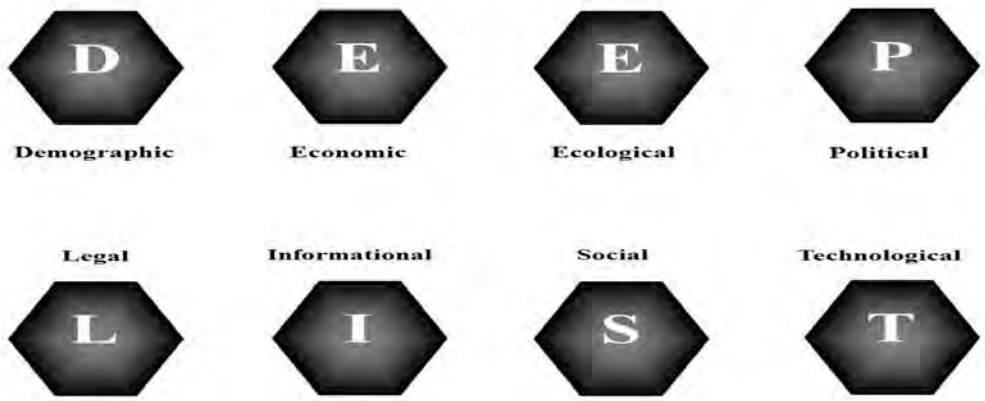

Figure 2. Adapted from Finlay (2000)

STAKEHOLDER POWER

This demonstrates some of the tensions between the academics and the industry. After years of arguing for 'studies' over 'management' a more conciliatory position was reached as Morrison (2004:3-4) explained:

> *the circular nature of this debate has become extremely tiresome and it is on the verge of stagnating. It would appear that hospitality academics are losing sight of what we are about. First and foremost we are creators, custodians and imparters of knowledge within an educational process that is our duty to society, untarnished by territory disputes and battles*

> Lashley (2004:329) on studies comments he;

> *still resolutely supporting the merits of 'studies' suggested: work exploring the nature of hospitality form an array of social science perspectives provides opportunities to support the development of those being prepared for management in the hospitality industry by encouraging the study of hospitality and management through critical and theoretical perspectives*

Lashley *et al*. (2007) demonstrated their vision for the future in their follow-up from the highly influential and much quoted 'In Search of Hospitality' with the 'Hospitality: A Social Lens'. They suggest that the pre-occupation with the vocational roots of hospitality HE and the 'management' or 'studies' debates have had their day and that a broadening of curriculum was equally beneficial to the industry in the long term. The need for students to understand and develop the skills to manage was necessary, but they argued for a more rounded appreciation as being desirable. There is general agreement by many academics, eg:

Lam and Ziao (2000), Airey and Tribe (2005), Morrison (2002), Morrison and O'Mahoney (2003), Jones (2004), Lashley (2007), Woods (2004), Morrison and O'Gorman (2006), Lynch and Morrison (2007) and Woods (2008) on the educational benefits of a more liberal approach incorporating aspects of culture, anthropology, philosophy and sociology, albeit at the expense of the natural sciences. Even so the liberal approach has its critics, particularly aimed at the 'three domain approach' put forward in (Lashley and Morrison 2000) which is 'In search of hospitality'. Slatterly (2002) refutes the ideas proposed in these publications as degrading the hospitality industry. His most venomous attack is on the three domain approach, which covers the social, the private and the commercial domains as well as definitions of hospitality. Slattery (2002) explains:

> *The three domain approach explicitly excludes essential features of the industry so that what is left is a denuded and sterile conception of commercial hospitality and hospitality management that is portrayed as a poor relation to the hospitality available in the social and private domains.*
>
> (Slattery 2002:23)

To investigate the theory of power the literature looked at the work of Weber (1947), Foucault (1972) and Lukes (1974 and 2005). To investigate stakeholder theory it will be necessary to consult Freeman (1984) and Mitchell *et al*. (1997) to explore the power dynamics. Figure 3 was used as part of the projective technique model to ask the interviewees where they matched the stakeholders against the power model.

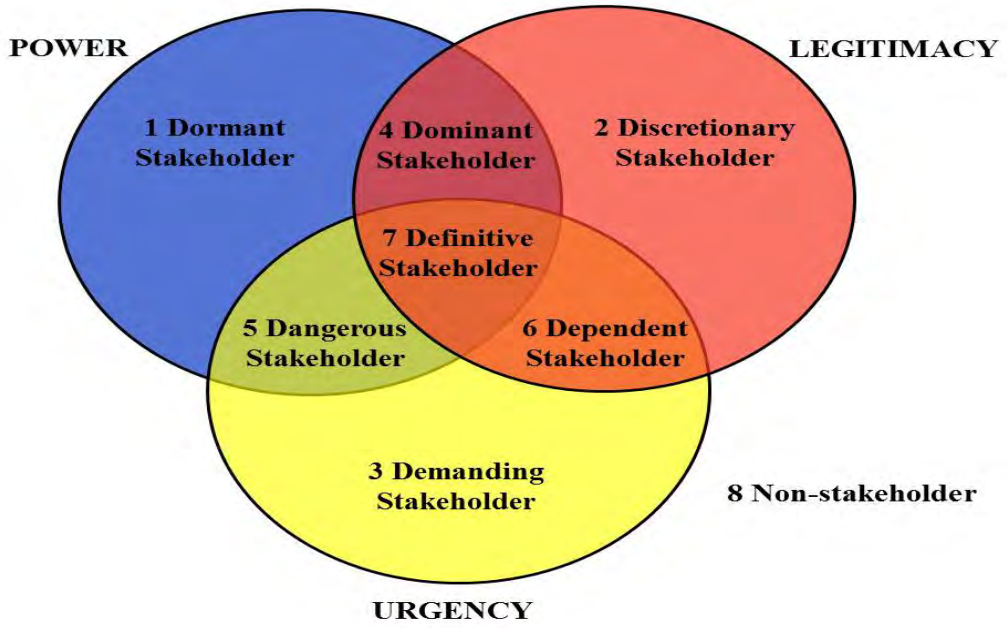

Figure 3 Adapted from Mitchell *et al.* (1997:874)

Rationale for using Projective technique methodology to gather the data and how it can be adapted to individual research

The three key themes were used to gather qualitative data by creating a pictorial model which enabled both verbal semi-structured interviews and the interviewees also interacted with the model. The methodology will explain how this model was created and used. The purpose of the paper is to encourage researchers to create their own models to meet their personal aims and objectives.

The author is convinced the opportunities are vast and given the use of modern technology the potential to create apps and distribute using iPad's that can capture the data are significant.

METHODOLOGY

Data for the PhD was collected in three phases. Phases one and two used semi-structured interviews and focus groups with academics, students and industry representatives. Phase three involved a projective technique to analyse the operational forces shaping the hospitality curriculum. This section concentrates of phase three and the development of the model and how to use the model.

DEVELOPING THE MODEL

The model needed to ask questions in three phases. Therefore the model evolved by having three distinct sections, 1, DEEPLIST, 2, Stakeholder theory and 3, Curriculum space. Figure 4 is the final model for this research.

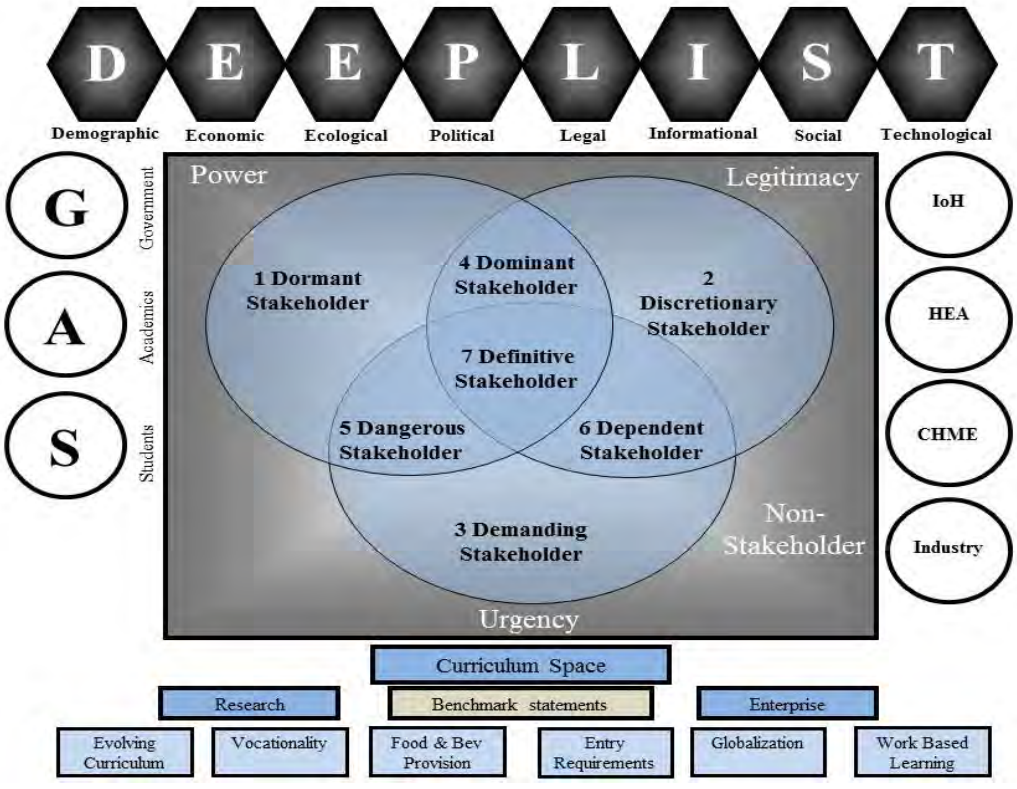

Figure 4 How Projective Technique Model used for PhD

The interviewees follow the instructions below

Step one

DEEPLIST is used to discuss the remote environment factors to picture the future trends for hospitality programme curriculum

The researcher begins by turning over the first card (Card D) in the top left hand corner.

On the back of each card is a brief explanation of the topic. The first card is Demographics

The back of the card has a list of suggested topics to discuss.

Demographic: Age variance; Gender; Ethnicity; Composition of labour force; Accreditation routes

Economic: Global economic issues; University funding; Future of the industry

Ecological: Sustainability; Environmental; How is this embedded in curriculum

Political: Resource issues (funding); Governance; Power; Supranational; National; District

Legal: Laws and regulations; Health and safety; Hygiene; Risk assessment Informational: New raw material; Access to data; language skills

Social: Life skills; Student type; Needs; Wants; Aspirations

Technological: New products; Processes; Materials; Electronic data interchange; Pace of advance

The researcher will also give a broad outline of the areas for discussion. When completed the researcher will move to next card on the right and follow the same procedure. When all the DEEPLIST are complete the researcher will move to step 2

Step 2

Step 2 involves the interviewee selecting the six key stakeholders one at a time and positioning in the appropriate category.

Latent stakeholders	*They possess only one of the identifying attributes*
1 Dormant stakeholder:	They have the power to impose their will on a firm, but that power is unused. They could become very effective if they acquired the attributes of legitimacy and urgency.
2 Discretionary stakeholder	They have a legitimate claim, but on their own management would not consider them important with the absence of power and urgency
3 Demanding stakeholder	They have an urgent claim but due to their lack of power and legitimacy unlikely to be considered important by management
Expectant stakeholders	*They have a potentially more likely opportunity to an active stance on the management as opposed to the passive stance of the latent stakeholders:*
4 Dominant stakeholder	Where they have power and legitimacy together a "dominant coalition" is formed. If they chose to influence the management with an urgent claim their views and opinions would certainly matter.
5 Dangerous stakeholders	A stakeholder with some power and urgency who considers the best way to gain power is by coercive or possibly violent means, as in wildcat strikes, to illegally get results.
6 Dependent stakeholder	They lack power but if they have an urgent claim, they would be dependent on the advocacy of others to achieve their goals
Highly salient stakeholder	*Stakeholders who hold all three attributes*
7 Definitive stakeholder	Perceived by management to be important and influential in decision-making.

Table 1 Mitchell *et al.* (1999)

The stakeholders are marked on moveable poker chips either side of the circles

It is necessary for the researcher to explain the categories using the following table

- G = Government UK government
- A = Academics Hospitality management academics
- S = Students Hospitality management students

- IoH — Institute of Hospitality
- HEA — Higher Education Academy
- CHME — Council of Hospitality Management Education
- I — The hospitality industry

Non-stakeholder was offered as an option should the interviewee not wish to regard the organisation as a stakeholder.

The final step requests the interviewees discuss the Educational factors at the bottom of the diagram from the top card and working from left to right

The results section will give examples of some of the results of the participants

RESULTS

Phase three projective technique method enabled the rich experiences of very expert interviewees to strengthen the validity of the data. By their very nature, industry and academic experts from hospitality come from only a limited background. These experts were already known to the researcher and were chosen purposively. In phase three all interviewees were in a position to have observed deeply, widely and over an extended period of time the issues surrounding HE hospitality management programmes. A degree of political involvement was inevitable and this would affect the discourse and discursive constructs accessed

Figure 5 shows how the model was used:

Figure 6 is an example of how a interviewee interacted and moved the poker chips to show where the stakeholder power fits in the Mitchell *et al* (1999) stakeholder model.

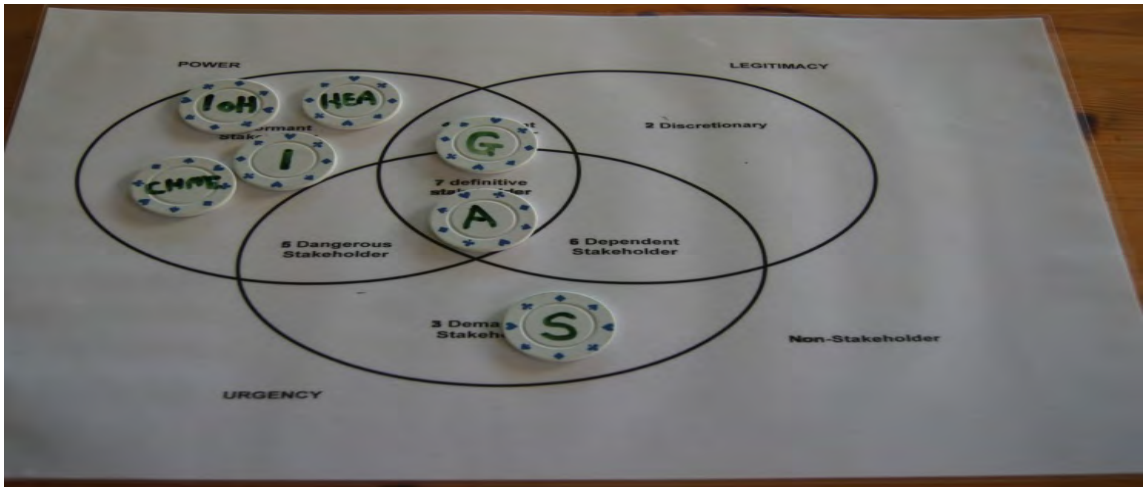

Figure 6 Interviewee example

The interviewees who participated in the projective technique methodology were all asked for their views on projective technique. They were all positive with comments such as:

> *I was a little apprehensive at first and not sure what to do as it looked complicated. It made me think long and hard in a more interesting way than just question and answer. I would consider using a similar model for future research.*
>
> Respondent 4

> *I like the idea of supporting semi-structured interviews with photographs of the stakeholder positioning. The structure worked for me and I had the opportunity to make suggestions to add stakeholders to the suggested list. One of my frustrations with supervising Masters Students is that they plan semi-structured interviews and then say the interview lasted only 10 minutes. This type of structure offers excellent pointers that avoid very brief yes or no answers. I will consider similar models for my supervision.*
>
> Respondent 8

The on-going research involves undergraduate, masters and PhD supervisors who are encouraging researchers to create their own projective technique models to match their individual aims and objectives. The researchers will be interviewed after completion and the models will be collected and used as examples for supervisors and new researchers. Further data will be collected from the researchers on the views of their interviewees. One of the interesting developments is the opportunity to create models on I pads or computer programmes whereby interviewees can use touchscreens to interact and keep this rich in-depth data.

The research to date has shown the DEEPLIST (Finlay 2000) or PEST or PESTLE can be adapted for researchers to review future trends and has been utilized by many researchers. The stakeholder model (Mitchell *et al.* 1999) is useful but less generic. Some of the models being considered by tourism, hospitality and Events students for use in projective technique are 'A social lens' (Lashley *et al.* 2007: 175), 'Curriculum space and influence' (Airey and Tribe 2000), 'Thanotourism' (Hartmann 2014) and 'Comparing event models', (Schneider 2003)

CONCLUSION

This study explains how projective technique was used and how the tool evolved. The model used demonstrates how the interviewees interacted and responded with examples of how the model stimulated interesting and informative data including tape recording of the verbal responses and photographs of the results of their input to the model. The potential opportunities for researchers to add an interesting dimension to qualitative data collection has been discussed. Finally projective technique can easily be adapted to modern technology to gather data on Ipads and computer programmes

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HUMAN RESOURCES: THE CAPSTONE FOR PALESTINIAN ICT ENTREPRENEURSHIP

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ABSTRACT

This paper discusses the potential of technology entrepreneurship in Palestine through identifying and evaluating the availability of quality human resources within the ecosystem. It investigates the human resource pillar as identified by the World Economic Forum (2013) within Palestine. Entrepreneurship is gaining an increasing importance in the Middle East in general which can be seen in the recent boom; most of the entrepreneurship activity in Palestine is either ICT centred or has some link to ICT, which leads Palestine to aim to become a major hub for ICT start-ups. This makes studying this ecosystem pillar important to know how the ecosystem will develop, raise concerns and introduce recommendations to how identifying and educating entrepreneurs should be done. This research assesses the human resources ecosystem pillar's characteristics in Palestine through a qualitative study based on interviews with experts and entrepreneurs in the Palestinian entrepreneurial scene. We also demonstrate, through this, that although human resources are limiting the Palestine ecosystem potential, with some tuning it can be developed to contribute to creating a successful entrepreneurial ecosystem, with ICT being the primary field.

Keywords: ICT ecosystem, education, culture.

Abbreviations
GDP: Gross Domestic Product
ICT: Information and Communication Technology
IT: Information Technology
KPI: Key Performance Indicators
MENA: Middle East and North Africa
PNB: Palestine for a New Beginning

INTRODUCTION

There are six main entrepreneurship ecosystem pillars defined by literature: policy; finance; culture; infrastructure support; human resources; and markets (World Economic Forum, 2013). Each of these contain many variables that influence and drive the ecosystem. This paper will discuss the human resources pillar.

Through this research the available human resources in Palestine will be analysed by looking into entrepreneurs' education, experience, training level and so forth. These variables will then be assessed in terms of their impact on the ecosystem development and Information and Communication Technology (ICT) ventures' quality.

At the moment ICT entrepreneurship in Palestine is rapidly gaining in importance and acceptance at the community level, with most newspapers dedicating monthly or fortnightly columns to introducing new start-ups or interviewing key personnel who contribute to the entrepreneurship scene. The main newspaper in Palestine, AlQuds, even used to issue a quarterly magazine called 'Digital AlQuds' between 2012 and 2013 dedicated to ICT news in Palestine and in the world.

Moreover, there is a growing interest in attracting people into ICT entrepreneurship and developing their skills proved by the increased interest in activities like start-up weekends and Hackathons (Petersen-Paaske, 2014), and the increasing importance of guest speakers who address the developers as part of such activities (startupweekend.org, 2013). Furthermore, these activities are usually sponsored by international companies like Google and Microsoft which show global interest in the area's ICT capabilities.

Palestine has a unique political situation resulting in a small and fragile economy. The Israeli occupation has imposed a series of closures on the country since 2000, resulting in the collapse of the tourism industry and barring the flow of most exports and imports (GEM, 2010). With no way for an economy to survive under these conditions and with a national education levels among the highest in the Middle East and North Africa (MENA) region, directing efforts toward ICT internet-based entrepreneurship was a logical decision. In 2011 the ICT sector contributed 6.4% of the Palestinian Gross Domestic Product (GDP) compared to 0.8% in 2008 with an annual growth of 25%. It is expected that the ICT sector will eventually account for as much as 21% of GDP (The Portland Trust, 2012).

Palestine offers significant advantages and incentives for companies that want to outsource their Information Technology (IT) operations to locally initiated start-ups, as the workforce has a relatively wide range of IT skills, and the banking environment is well-regulated, making Palestine relatively investor-friendly from a financial point of view. The workforce in Palestine is its main strength as highly educated employees are relatively cheap in the ICT sector. Hiring an ICT professional in Palestine costs 75% less than Western Europe or the US, and even 25% less than a similar professional in India or China. When such low cost is combined with the relatively close proximity to Europe and US, good language skills and cultural awareness of the workforce, Palestine could be considered a rich land that fits the international ICT industry requirements (The Portland Trust, 2012).

CONCEPTUAL FRAMEWORK

Human resources (HR) are crucial, where they make a great start-up or break it. HR and its derivatives importance can be seen since the early entrepreneurship literature. Song et al (Success Factors in New Ventures: A Meta-analysis, 2008) conducted meta-analysis of entrepreneurship research between 1995 and 2003 and found founders' experience and team size to be among the top start-up success factors. Similarly, Preston (Success factors in technology-based entrepreneurship, 2001) had attitude, team and passionate behaviour among his start-up success factors. Kakati (Success criteria in high-tech new ventures, 2003) considered entrepreneurs' quality to be the most important factor for start-ups success. Moreover, Boyer et al (Critical success factors and performance measures for start-up social and environmental enterprises, 2008) in a report for the SEED Initiative (Home page, 2014) included leadership characteristics and management skills in start-ups' success factors. Finally, Empson (What Makes A Startup Successful? Blackbox Report Aims To Map The Startup Genome, 2011) defined team structure and mentorship to be among the top trends that help a start-up succeed.

By looking into the previous literature, generalisation can be made. Researchers agree that the entrepreneurs' personal characteristics, diversity and management capabilities are the main critical factor that makes a start-up succeed or fail. It is also clear that researches indicate that a technology start-up team should not consist only of engineers and programmers but rather should contain co-founders experienced in management and marketing. Despite all this, some consider the entrepreneurship team's experience prior to initiating the start-up insignificant and its importance to be exaggerated.

Culture plays an important role in shaping HR by influencing how the community views entrepreneurship and failure acceptance. A supportive culture will yield more entrepreneurs than a non-supportive culture. The cultural rejection of entrepreneurs can often be seen as a form of stigma (Goffman, 1963). Entrepreneurs suffer from two types of stigma: stigma of success and stigma of failure, with the latter being the more common cultural barrier (Preston, 2001). Failure stigma has lots of research and literature around its causes, while success stigma is rarely discussed as it is less significant. The stigma of failure is how the community views an individual who attempted to create a start-up and failed. Thinking about it may even push the potential entrepreneur to become reluctant to take risk, fearing they will lose the social groups' trust. Statistics show that 57% of investors would not invest money in a business if the manager was part of a failed venture before, and even 47% would not be inclined to purchase goods from this individual's current business; this is thought to be because people view honest and fraudulent failure in the same way (European Commission, 2008). In Europe if an entrepreneur went bankrupt their future would be ruined. However, as mentioned earlier in this section, if the same happens in Silicon Valley that would simply be considered entrepreneurial training as the US laws allow for rapid discharge from bankruptcy in a period as short as twelve months (Department of Enterprise, Trade and Investment, 2006; Honyes, 2010). Moreover, the second type is the stigma of success which is based on the belief that wealth is shifted rather than created. Hence for someone to get rich, others have to become poor. This culture encourages successful start-ups to relocate to a more culturally friendly location, namely the USA (Preston, 2001).

HR is also related to how talented the workforce is, how much technical or managerial experience they have (World Economic Forum, 2013). HR is reflected in the team mix: Eric Savitz from Forbes (The 3 Things Startup Founders Need To Know About HR, 2012) identified that a team mix with founders' personalities that match the diversity of the customer base is a key factor for success. This agrees with previous research that suggests that a correct entrepreneurs mix is crucial for a start-up success. In their research Politis and Gabrielsson (PRIOR CAREER EXPERIENCE AND THE DEVELOPMENT OF ENTREPRENEURIAL KNOWLEDGE, 2002) explained this based on Lamont's (What Entrepreneurs Learn From Experience, 1972) research: they argued that the importance of a diverse management team is the ability to handle "the liabilities of newness", i.e. the risks, where an individual who has wide cross-functional experience will be able to handle newness more effectively. Since achieving a very wide cross-functional experience is not easy, this can also be achieved by means of a diverse team. HR capital can be split into knowledge achieved through education and skills gained through the work experience both cofounders and employees have (Becker, 1964). What differentiates education and experience from other HR aspects is that both are transferable and thus can be replicated relatively easily. Furthermore, previous research shows that employees with higher education and experience are more productive in high-tech industries (Wright, Hmieleski, Siegel, & Ensley, 2007).

Advanced previous experience could be split into experience in starting ventures and in managing firms, especially small ones; both would count in the entrepreneurs' ability to recognize opportunities, effectively cope with challenges, and solve problems based on their prior exposure to similar situations. (Shane & Venkataraman, 2000; Shepherd, Douglas, & Shanley, 2000; Shane S. , 2003). Gabrielsson and Politis (Work experience and the generation of new business ideas among entrepreneurs: An integrated learning framework, 2012) found that previous management experience will count toward the ability to deal with the new situations and handling diverse functions. Moreover, previous experience in managing small businesses was found to be as important as previous experience in starting a venture and dealing with challenges. The main benefit entrepreneurs' gain from prior start-up experience is the increased ability to recognise opportunities and potential to spin out more opportunities from their existing ones. The contrary finding of Politis and Gabrielsson (PRIOR CAREER EXPERIENCE AND THE DEVELOPMENT OF ENTREPRENEURIAL KNOWLEDGE, 2002), that previous managerial experience could be a disadvantage, can be explained in the way they measured it which was in terms of managerial years only, without including the quality of management factor. Finally, considering Kolb's (Experiential Learning: Experience as the Source of Learning and Development, 1984) study states that for effective learning from previous experience a person has to grasp the experience, then transform it into knowledge. Such knowledge transformation can be achieved more easily in some situations than others,

meaning that if the entrepreneur's previous experiences of the field and start-up ventures are relevant, such transformation could be more effective than if the previous field of expertise was totally different.

METHODOLOGY

The research is based on eight in-depth Skype interviews which were held between August 2014 and October 2014. Interviews discussed all ecosystem pillars and extended over an average time of 1:22 hours, totalling 10:58 hours. The relevant parts used for this paper were the discussions of human resources and education accounted for around 25% of the total discussion.

Analysis was done thematically using NVivo10. The researchers went through the imported audio recordings and tagged them with thematic descriptions. Questions revolved around the education level and quality most entrepreneurs have, mentorship and trainings provided, promoting events to attract entrepreneurs, experience required before initiating a start-up and current entrepreneurs mentality.

Palestine has multiple incubators, one technology oriented VC, and few other investment organizations. Many NGOs are also funding and pushing entrepreneurial activities including USAID, Welfare Association, Mercy Corps. and others. Currently there are tens of ICT start-ups existing in Palestine.

The target interviewees were picked to represent all levels of the ecosystem; that is at least one incubator or accelerator, one VC, one NGO, one technology expert, and one entrepreneur. The researcher followed a snowball methodology to interview people. An established contact, a principal at a VC, was asked to introduce the researcher to other experts, and each expert was asked to make introductions to others at the end of the interview. In total eleven personnel were contacted; eight of them were able to take part in the research. The researcher could not get a reply from anyone working in the government sector. All personnel were chosen based on their reputation in the Palestinian entrepreneurship scene and expertise in the field, all held senior roles in their respective organizations and had been involved in entrepreneurship in general and specifically in Palestine for few years. The interviewee list and their respective positions at the time of the interview are as follows:

- Ambar Amleh: Digital Entrepreneurship Program Manager at Leaders Organization & Programs Manager at Palestine for a New Beginning (PNB)
- Faris Zaher: CEO at YaMsafer (entrepreneur)
- George Khadder: CMO at Yafa Energy, freelance consultant and co-founder of Peeks
- Khaled Abu AlKheir: CEO at Pinch Point (entrepreneur)
- Mohammed Musleh: Ex-Head of Palestinian Information Technology Association, and currently a freelance consultant.
- Taylor Valore: Principal at Sadara Ventures
- Tova Scherr: Ex-Program Manager at Mercy Corps, and an expert in the ICT start-ups ecosystem.
- Younis Hammoudeh: Entrepreneurship project manager and business coach at NZITCE

All interviewees signed a consent form approving the use of their real name and quotes. Interviews were conducted either in Arabic or in English depending on the preference of the interviewee and to match their native language.

HUMAN RESOURCES IN PALESTINE

HR will be discussed from four axes: workforce education and R&D, workforce exposure, the existence of talent and skills, and the cultural support that influences their diffusion to entrepreneurship.

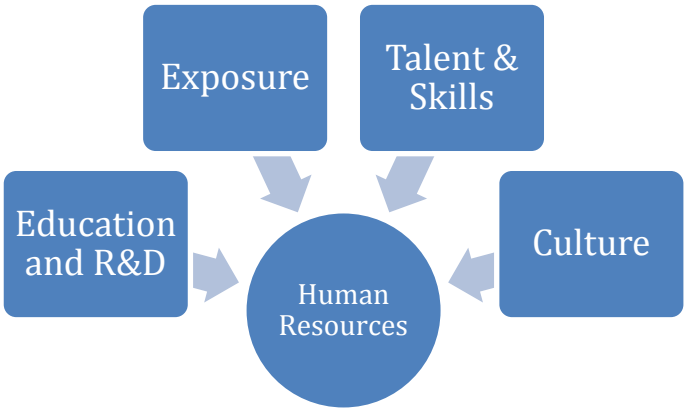

Figure 1: Human Resources axes

Education and R&D

The first step in building technology entrepreneurs is education. University education provides the basic tools and skills an entrepreneur will use. The majority of the workforce in Palestine is educated at local universities and most entrepreneurs are fresh graduates which makes looking into local education systems very important. This section will look at the education system with a top-down view, starting from the universities then going to the high-school system and finally looking at the cultural influence of students study decisions. The section will then look at the other attributes affecting the entrepreneurial human resources.

The university education system is filled with flaws which can be identified on many tiers. Firstly, according to Ambar, George, Taylor and Younis the system fails to provide entrepreneurs with the rounded knowledge needed to start a company, as technology majors focus on technical modules and nearly completely ignore non-technical aspects. While doing so they still lack an R&D culture which causes even the technical knowledge to lack behind or even deteriorate over time. The lack of R&D according to Mohammad also causes the university education to drift away from real life business sectors. Secondly, Faris added that local universities do not push their students enough to make them quality graduates. This problem is multiplied as according to George students generally tend to be lazy and do not seek knowledge, which he surmised might be caused by the mediocrity of NGOs. This causes graduates to be non-competitive, and if local graduates are interested in developing themselves they would have to do it all by themselves through attending events similar to start-up weekends or self-studying.

The previously mentioned flaws are caused by a fundamental problem amongst university lecturers. It was noted multiple times that lecturers are not up-to-date and do not understand the market themselves, they know the theory but do not know the practice. This is caused by the lack of university-business integration. This flaw extends to the student graduation projects where they are done for the sake of graduation without having any ‘bases in reality’ (Tova, NGO); instead Tova noted that the right way is to direct students to create graduation projects that are based on needs. This will lead to continuous projects or jobs in the fields they addressed. The lack of student project integration with industry could be partially addressed, according to Tova, in the form of placements and internships as part of the university education which will expose the students to the job market. Moreover, as Younis worked with university graduates at an early stage, he noticed a problem caused by the reliance on US text books. According to him, this shapes the students’ expectations in a way that fits the US market but not the local or regional markets; this is problematic as much of what they learn is not locally relevant.

All university problems could be minimised if real steps toward education-private sector integration are made where lecturers and students work closely with the business world. When that happens lecturers will pick textbooks that fit the local markets better, they would also explain the difference between theory and practice locally and regionally, and students would have more hands-on experience with the industry.

Education problems do not start at university level but before that. First, the Tawjihi (the Palestinian high school general certificate examination) system is flawed; both Mohammad and Tova questioned the suitability of the current system in deciding what prospect students pursue for their bachelor degree. There was a note regarding the need for a major reform in the system like the USA open major system where students take general modules in their first year then decide what to study based on their interests. Even if such a change happened there is a cultural barrier where, according to Mohammad, parents may force their children to study specific specialisations. This causes a problem of diverting some of the smartest students from technology related studies to medical related, apart from causing a mismatch between the number of graduates and the labour market.

Tova noted that most education problems are well known at the level of NGOs but the fact that it is a huge issue means it is both much bigger than any NGO could handle and the long amount of time required for change implementation exceeds the normal NGO funding cycle (1-4 years) thus preventing them from acting to solve it. Instead, such problems should be addressed at the ministerial level.

Taylor noted that despite the obvious lack of knowledge that fresh graduate entrepreneurs suffer from, the knowledge holes could start to be filled after a year of involvement in the ecosystem where they could get introduced to the basics of topics they should know. Faris even marginalised the importance of academic education, especially in non-engineering fields, and considered it to be irrelevant in the real-life workplace. From his point of view education only offers validation of someone's seriousness in a specific field.

Going away from formal education, most entrepreneurial organisations offer training courses in an attempt to cover the educational gap. Taylor considered this to be overcompensated with most support organisations offering training programs effectively saturating the system. Yet such training is not free from problems either: 'I think there is a lot of training, I do not think its good training' (Ambar, Accelerator). Ambar added that a new way of coaching and one-on-one mentorship is what is needed. This is confirmed by Taylor who also noted that FastForward now abandoned formal mentorship sessions and moved into new training methods. Despite what has been said, Faris considered most training courses to have minimal benefit and that the right way to develop entrepreneurs is through filling a position at a company.

Exposure

Moving from taught knowledge into hands-on knowledge, previously it was discussed that the founding team's characteristics, experiences and entrepreneurship skills are of the highest importance for a venture's success. All the interviewees unanimously agreed on the importance of the venture's staff skills and characteristics, and they used "exposure" as an overarching term to describe their characteristics and talked about it as a multi-faceted characteristic.

Figure 2: Factors affecting exposure

The first type of exposure is to external communities and markets, 'a lot of the entrepreneurs that we are working with either have studied outside, have travelled outside, etc. they are much more exposed to global markets' (Ambar, Accelerator). According to Mohammad, people who lack this kind of exposure would be more focused on the limited local market as they are not aware of their capabilities to serve external markets from within Palestine.

The second type of exposure is to the job market. As most of the Palestinian entrepreneurs are fresh graduates with no previous experience, this is a considerable problem as this should be 'the exception not the rule' (George, Community leader). Taylor mentioned that lacking experience results in a lack of international trends knowledge. This makes it harder for entrepreneurs to find a product and know how to penetrate international markets with it. 'Real entrepreneurial ventures come out of years of experience and being in the market... you need to be exposed to the problem to come out with a competitive solution to it' (George). The "directly out of university" entrepreneurship – with no previous experience - means that the technical, innovative, managerial and mind-set exposure would not be high among entrepreneurs in Palestine. Support organisations like Leaders try to do their best into developing such exposure by bringing international coaches to address entrepreneurs and provide one-on-one mentorship. Yet there is a fine line those organisations are trying not to cross which is doing the entrepreneur's job and research which they are supposed to do themselves.

Taylor mentioned that when looking at the entrepreneurs' experience, there are problems with both managerial and technical knowledge. However, entrepreneurs' technical knowledge is far better than their managerial expertise: this could be an indicator that most entrepreneurs come from technical backgrounds. Although George argued that the local talent pool is generally good enough he still noted that when it comes to specialised technical or business talent there is a gap. This was backed-up by Mohammad who said 'it's hard to find subject matter expertise'. Moreover, according to Faris' and Khalid's experience they

suffered from a lack of people with the skills and talent that is relevant to their specific start-ups causing them to take longer to reach their goals; not having the various needed skills and experience from different backgrounds would result in a struggling start-up and maybe failure. Nevertheless, it is natural for the current talent pool to be weak as the ecosystem is still at an early stage, and specialised talent pools take time to emerge where it is generally created by having various ventures that start and fail. In the case of Palestine the talent pool deficit cannot be solved by local IT companies. Although such companies solve what is considered to be the biggest gap by Taylor, which is the knowledge and mentality of solving a business problem through technology, these companies are mainly outsourcing companies which is not the best suitable to start a business according to Taylor. Younis also added that an outsourcing company will generally handle minor pieces of products (low value products) which results in a workforce who are not experienced when it comes to creating core products that require extensive knowledge in algorithms; a point which Faris backed-up too.

The third type of exposure is 'age maturity' (George) which co-happens with the previous two types. This disadvantage unfortunately cannot be solved with mentorship programs, but fortunately since it comes naturally with life and job experiences it is of marginal importance and has negligible effect on its own.

The fourth type of exposure is having open mind-set to accept and adapt to new ideas. George noted that it is extremely critical to have an open mind, it even exceeds the importance of having the experience itself, as those who have it can adapt faster to changes in the world. Fortunately this kind of exposure is provided and induced to a great extent through the web.

After looking at the four types of exposure plus education, the question that arises is about how much exposure any entrepreneur could have. Exposure and various talent is hard to be found within one person; 'unless a technical guy gets the right business skills I do not think a technical guy can do it all... it's short sighted to think you can do it all' (George). In fact Younis said that although experience has a great impact on an engineer's management skills they would still lack when it comes to sales and marketing, thus a founding team who come from various disciplines and experiences would provide better results by complimenting each other, 'It's always about well-rounded teams' (Ambar, Accelerator), 'you should find cofounders who add to your skill set' (George). Younis illustrated that in most cases technical people tend to have an arrogant personality where they underestimate the role of management people and think that people will run to buy their products once they make them, yet even entrepreneurs from management backgrounds tend to also underestimate tech people and think about hiring them instead of having them as cofounders. Tova noted that most entrepreneurs come from technical background, and some of them do eventually team up with business, designers and other non-technical people but this usually happens at a later stage, yet for best results this should be done at an early stage. Then after creating a team regardless of its mix there is a problem of assigning duties and having a clear structure according to Younis.

Mohammad and Taylor compared the local entrepreneurs' exposure to the region. On the one hand, at first glance it seems that they disagree about the local entrepreneurs exposure compared to the regional entrepreneurs. Taylor considered the local entrepreneurs to have similar or even better exposure, while Mohammad considered the local market to lack people who have international exposure and understanding of start-ups, compared to what is available regionally. On the other hand, through a deeper look at what they said it turns out they could actually have similar opinion where there are less number of entrepreneurs who get accepted to programs where both Mohammad and Taylor could meet them, but when it comes to the level of exposure those entrepreneurs have, it is relatively high.

Talent and Skills

For a group of entrepreneurs to create a successful venture they need more than just exposure and education; they need to have entrepreneurial DNA, reliable workforce and encouraging culture. In terms of DNA, it was noted many times that people who go for entrepreneurship actually lack the entrepreneurial DNA, 'someone should have the entrepreneurial DNA for it to be

developed through training' (Faris, Entrepreneur). This could also be linked to a previously mentioned characteristic in the literature which is the entrepreneur's passion. Some of the interviewees thought that many entrepreneurs lack it and are just 'want-to-preneur' (Younis, Pre-Incubator); they do it simply because it's 'glamorous and sexy' (Mohammed, Expert), not because they believe in it.

In terms of workforce, both entrepreneurs mentioned creating a team as a major challenge in Palestine, where there are not many professionals having enough experience in the field. This is caused either by barriers of diffusion from the normal job market to entrepreneurship work or by professionals' reluctance to go into entrepreneurship. The first was noted by Tova who said that older professionals who are at their late thirties or forties do not have dedicated portals which provide easy access to information that promotes entrepreneurship. This is unlike the case of university graduates who can acquire most of the information they need through excellence centres located at university campuses. The second was noted by Taylor who explained that many experienced professionals are wary about the rising start-up mentality; they think it is a bubble that soon will explode and everything will go back to what it originally was once the donors lose interest so to play it safe they stick to their normal jobs.

Despite those problems the existing workforce has its own advantages. For starters, Khaled said that Palestinian workforce tend to be more creative and loyal with much lower churn rate compared to others in the region. Mohammad explained this phenomenon by pointing out that most professionals who work in Palestine are there due to the existence of barriers of transport mixed with their preference to work in Palestine. Another advantage is their cost, where according to Ambar the operational costs incurred by employment is comparatively lower than the Western world, despite the fact it is relatively high compared to other regional countries or places like India; indeed, the total cost of ownership to get the final bug-free product could be lower according to George. A third advantage for ICT professionals in Palestine according to Ambar is the high penetration of English alongside many other European languages.

Culture

In terms of a supportive culture, Palestine suffers from weak cultural awareness of entrepreneurship and its stakes. The culture barrier makes Palestine more challenging, but many events like start-up weekends are starting to break the ice. Tova noticed that after lots of entrepreneurial events targeting fresh graduates, start-up initiatives are starting to become accepted and parents are more acceptable to the idea of their children working in their own business initiatives instead of working for a well-established company. The older mentality started changing towards more acceptance of entrepreneurship by seeing well organised events which gives proof to the parents that this is a supported thing and their children are not the only people doing it. Yet this does not mean people started to accept failure: the stigma of failure is still highly dominant and still creates a major barrier with no "win-win approach" to business.

In order to attract experienced professionals into the start-up scene, a program called Start-Me-Up was recently started by Taylor with the help of other experts in Palestine to promote entrepreneurship to super-smart experienced professionals who did not consider entrepreneurship before. Such a program aims at introducing those professionals to concepts they need to know in order for them to start their own businesses through sixteen sessions, creating a 'mini mini-MBA' (Taylor, VC). The program is the first non-NGO driven mentorship program and is expected to have a big impact.

CONCLUSIONS AND RECOMMENDATIONS

To conclude, it is clear that entrepreneurs do not have enough knowledge nevertheless that is fine in itself as according to Taylor 'nobody has enough knowledge'. The important thing is to work for a company, any company, to gain the initial

knowledge of how companies operate. Moreover, as Taylor noted, the holes in the fresh entrepreneurs' knowledge could start to be filled after a year of involvement in the ecosystem where they would get introduced to the basics.

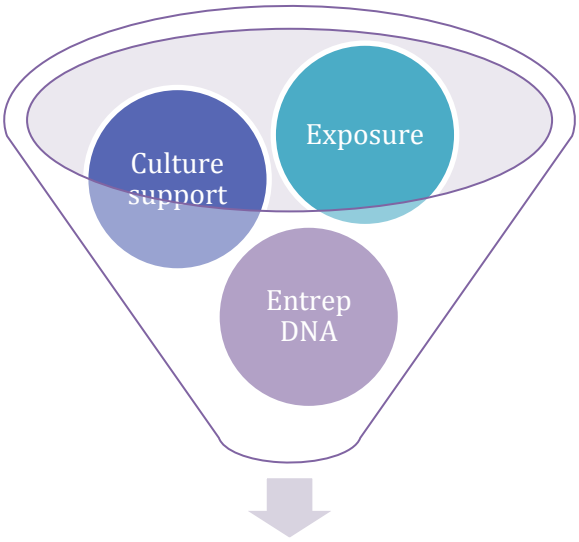

Figure 3: Entrepreneur creation funnel

At the moment, it is clear that universities are not playing a positive role in the education field in general, and in the entrepreneurship sector in specific. Universities should push towards integration of business modules in technology disciplines, and to have technology modules updated with the latest technology trends by encouraging their instructors to work with outside companies.

To achieve higher quality human resources we recommend the following:

1. Organisations should educate entrepreneurs about not underestimating the amount of work needed from them to create a successful start-up.
2. As entrepreneurs need to gain a few years of professional experience before considering entrepreneurship, those type of experts need to be targeted and encouraged to engage in entrepreneurship.
3. People who decide to engage in entrepreneurship and start their ventures should team-up with other entrepreneurs who have experience in other fields at an early stage.
4. All entities should work to leverage the Diaspora as those are experts who has very wide experience and exposure.

Future work should be conducted to dive deeper. There is a need for a deeper cultural study, and research on how the ecosystem entities are seeking to find workarounds that help to overcome both the success and failure stigmas.

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ADVANCES IN MANAGEMENT AND INFORMATICS:
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A MODEL OF THE DRIVERS FOR HOSPITALITY MANAGEMENT CURRICULUM IN THE UNITED KINGDOM

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ABSTRACT

This constructionist study explores the perspectives of key stakeholders on drivers for the evolving UK higher education hospitality management (HM) curriculum, and establishes the extent that opposing vocational and academic forces shape the HE hospitality curriculum.

The literature review focused on power theory, curriculum space, key themes in HM, stakeholder typology and remote environmental influences and future trends culminating in a conceptual framework showing three dimensions of power that shape the HE hospitality curriculum and identifying mechanisms through which stakeholders operate.

The methodology used interactive, projective technique as an enabling tool to rank stakeholders. The four separate interviewees are all prominent HM programme academics who are active members of CHME and represent England, Northern Ireland, Scotland and Wales.

The results and discussion ranks stakeholder salience and organises primary data under a series of independent but mutually supporting power mechanisms.

The thesis concludes that it is not so much power mechanisms *per se*, but on how stakeholders drive the UK hospitality curriculum through such mechanisms. Vocational and academic philosophies are both recognised as important. The time spent on vocational aspects within the curriculum has been reduced, surviving in more financially-viable formats dependent on local conditions and the stakeholder power. The reality is that stakeholders generally work co-operatively to achieve a balanced curriculum.

This study concludes that White's model 2011:252) can be used generically to support power studies in a range of contexts.

KEY WORDS: hospitality management curriculum, modelling power, stakeholder salience

INTRODUCTION

The aim of this paper is to construct a model for studying operational drivers of the Hospitality curriculum in Higher Education (HE) in the United Kingdom (UK). "The model must be comprehensive in scope and sensitive in its capacity to test, in-depth," (White 2016:1) the ways in which power acts to shape the Hospitality Management (HM) curriculum.

HM undergraduate programmes are relatively young with recruitment numbers expanding rapidly from the 1960s. Nailon (1982) suggests the curriculum evolved from a vocational foundation, based on a fusion of formal and inherited operational practices, supplemented with additional subject matter drawn primarily from social sciences. A move away from operational models to a reflective practice model was advocated by Casada (1992), Cousins (1993), Chen and Groves (1999) and Ingram (1999).

Since then, there is general agreement, for example: Lam and Ziao (2000), Lashley (2000), and Tribe (2002), on the educational benefits of a more liberal approach incorporating aspects of culture, anthropology, philosophy and sociology.

The Higher Education Funding Council for England (HEFCE) (1998:2) defines HM as '*the management of food, beverages and/or accommodation in a service context'*. The definition is concise but has limitations and is the subject of on-going debates about the opportunity to broaden the curriculum to include hospitality studies, hospitableness and understanding host-guest relationships. The early curriculum framework designed by Nailon (1981), the use of '*hospitality curriculum space*' (Dredge *et al.* 2012:2167) and stakeholder influences (Airey and Tribe 2000) and the Social Lens model (Lashley *et al.* 2007) are all significant perspectives.

Power in society is, '…the chance…of men to realise their own will…against the resistance of others...' (Weber 1948:180). Weber argues that exclusive groups or stakeholders exercise power, while Giddens (1984) argues that higher powers are not wholly opposed to the less powerful. Studying power in society is multifaceted (Foucault 1973) and multidimensional (Lukes 2005). Furthermore, power is difficult to evaluate and explore (Gaventa 1980). Yet, 'Power can be studied…but there is no short cut that takes us straight to power' (Morriss 2002:151).

1. LITERATURE REVIEW

Power is the "probability that one actor within a social relationship would be in a position to carry out his own will despite resistance" (Weber 1947). When observing the political elite who set the power agenda, Mills (1956:299) observes a 'political pyramid' and Dahl (1963: 73) demands a polyarchical approach to power, supported by Foucault (1976:95) who suggests that resistance exists everywhere power is exercised. Bachrach and Baratz (1962) propose two Faces of Power and Lukes (1974 and 2005), proposes a three-dimensional power concept to measure power and

to understand the less-visible dimensions of power relations. Accepting the existence of the third dimension of power envisages opposing vocational and academic philosophies in conflict.

Thus, the starting point for a conceptual framework is White's 'generic' (2011:261) power model. Foucault's notion of power and resistance is foundational as is the revised work of Lukes (2005) that reasserts the principal that power can operate in three dimensions. The model also shows a series of ten interdependent but distinct power mechanisms operating in the near environment that can shape outcomes, including academical versus vocational HM programme curriculum design (Figure 1). White's (2016:4) model puts Luke's three dimensions of power on either side of the mechanisms, which he identified after a wide-ranging review of sociological, feminist and power literature. DEEPLIST (Finlay 2000:192) represents remote environmental influences and completes the comprehensive approach to the field of power operating to shape HM education.

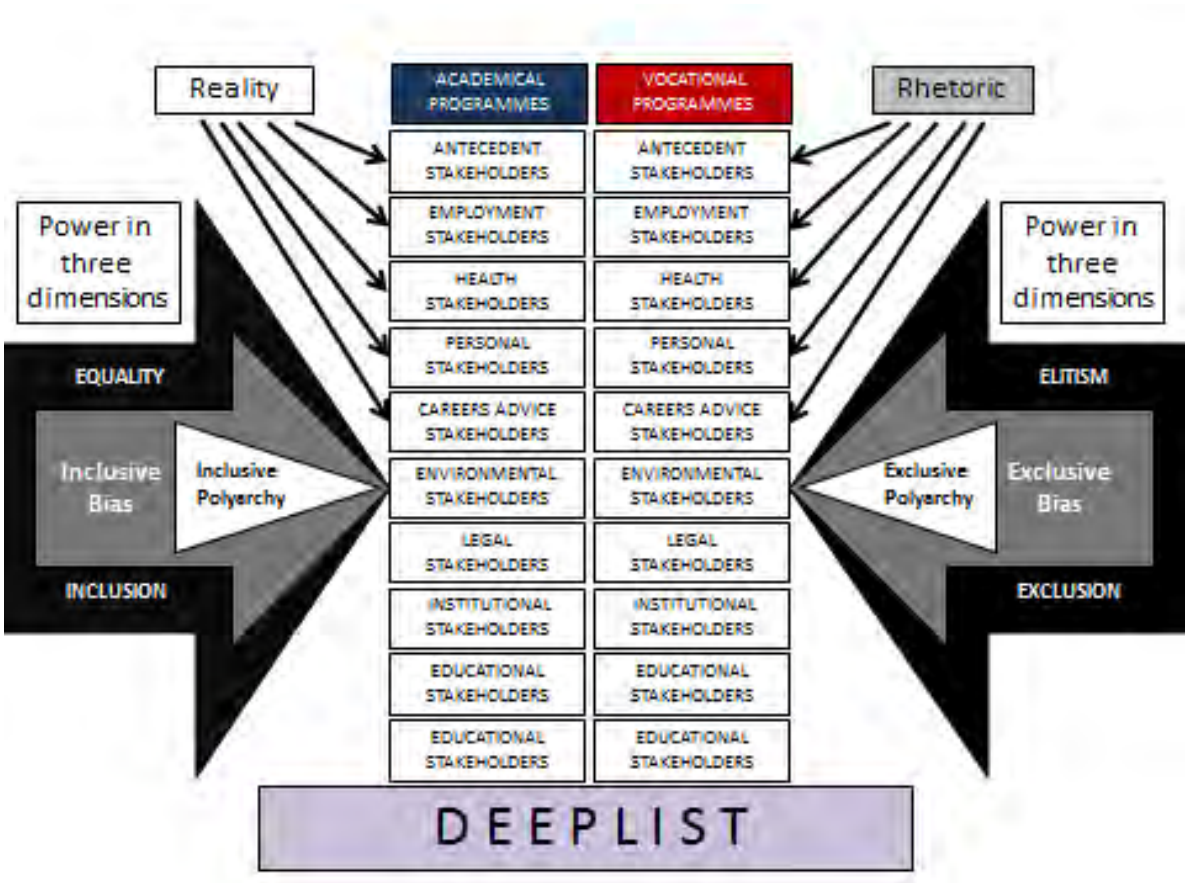

Figure 1: The whole field of power affecting HM education showing three dimensions of power that shape Academical Programmes' & Vocational Programmes' curricula in HE Institutions, through ten interdependent power mechanisms (White 2011:252 adapted)

The hypothesis is that powers operating in three dimensions are serving to shape the HM curriculum. Rather than using the framework to construct a research instrument, this study seeks to test the validity and reliability of the adapted power model using stakeholder analysis as the conceptual lens. Can stakeholder theory verify the field of power conceptualised in the above adaption of White's (2011) model?

2.1 A critical evaluation of key themes influencing the HM curriculum space.

2.1.1 HM curriculum space

Tribe (1999) developed a model of the influences on curriculum space with specific references to tourism and Airey (2007:3) argued that '*the contest over this space has intensified'*. Figure 2 lists a range of key stakeholder influences suggesting that they make decisions about what will be included and excluded.

<table>
<tr><td>Existing Course</td><td>Government Bodies</td><td>Professional Bodies</td><td>Employer Needs</td></tr>
<tr><td>Course Leader</td><td colspan="2" rowspan="3">Curriculum Space</td><td>External Validation</td></tr>
<tr><td>Course Team</td><td>Students</td></tr>
<tr><td>Academic Discipline A</td><td>Literature</td></tr>
<tr><td>Academic Discipline B</td><td>Academic Discipline C</td><td>Values of Society</td><td>Industry Research</td></tr>
</table>

Figure 2. Curriculum space (Airey and Tribe 2000:283)

2.1.2 Key Themes

Evolution

Up to the 1950s, the hospitality industry relied on work-based training (Medlik and Airey 1978). In the 1960s, HE began undergraduate work with passionate individuals who had strong industry links and a vision for new vocational degrees that drove HM programmes to meet student and hospitality industry needs. Three factors proved foundational; the professional bodies (HCIMA 1971 to 2006 and CHME 1990 onward), colleges and academics such as Nailon

(1981), Woods (1992), Casado (1992), Cousins (1993), Chen and Groves (1999), Ingram (1999), Brotherton (1999) and Lashley and Morrison (2000), and the hospitality industry (HEFC 1998).

Vocational learning

HM offered HE to students who had not taken traditional A-levels but vocational qualifications. Widening access initiatives also encouraged mature students to apply. Evidence shows that HM students prefer less theoretical, more activist learning (Lashley and Barron 2006), that they are gregarious and enjoy the service environment (Lashley 1994). Students prefer an active rather than reflective learning style promoted by government policy (Lashley and Barron 2003). Lashley (1999) suggests that educators face the challenge of developing the general standards of graduateness, which requires theoretical and critical elements together with practical and organisation inputs.

Food and Beverage (F&B)

There is general agreement that operational competence is at the core of HM programmes (Casado 1992, Cousins 1993, Coleman *et al. 2*002, Alexander 2007). Coleman *et al.* (2002) found F&B Practical sessions are core in all but one HE institution so HM programmes have recruited teaching rather than research-active academics (Alexander 2007), but reduced funding threatens quality so that, in practice, there is diverse and cross-curricular use of restaurants to achieve financial savings.

Achieving Quality Work-Based Learning (WBL)

The Dearing Report (1997) challenges curriculum stakeholders to encourage employers to provide more WBL for HE students and HM programmes achieved this goal by developing, and maintaining established industry links. Gleeson and Keep (2004) argue that students and employers have divergent WBL interests. Given this divergence, the professional bodies and the Quality Assurance agency (QAA 2007) strove to meet the needs of all stakeholders. Bradshaw and Coleman (2004:30) stated that'*75% of students achieve full-time recruitment as a result of'* WBL and returning students showed greater enthusiasm to learn. Among the bad practices identified with WBL are: poor Pay and Conditions, Health and Safety, poorly structured programmes and no supervision, poor attitudes towards students, no clear liaison with university and unclear tutor's role (PATH 2011:4). Consequently, the Council for Hospitality Management Education (CHME) commissioned Placement Advisors for Tourism and Hospitality (PATH), to work closely with all stakeholders to overcome these bad practices. The challenge involved creating a balance between education and training.

Entry routes and requirements

Higher Apprenticeships, formerly known as Foundation degrees (FdAs), introduced in 2000 to provide vocational HE based on close collaboration between employers and HE providers, aim to widen participation and deliver WBL closely linked to the needs of employers while introducing benchmarking (QAA 2004). The style of delivery includes a range of learning and teaching (L&T) methods, including problem-based learning, self-directed studies and distance

learning. In 2007 Further Education (FE) colleges, with their practical facilities, were given opportunity to award FdAs. In addition, Diplomas, as an alternative to 'A' levels provided new vocational routes into HE and employment (DfES 2005).

Globalisation

Some stakeholders see international students simply as a 'cash cow' in HE. The UK cannot afford to be complacent, as (Shiels 2006) predicted the overseas market would grow significantly by 2020. Integrating international dimensions into L&T strategies through the curriculum offers global horizons with a multicultural ethos for driving forward an internationalization strategy aimed at developing global citizens**.**

HM and the Higher Education Academy (HEA)

The HEA underpins UK HE and was formed in 2004 with a mission to *'help institutions, discipline groups and all staff to provide the best possible learning experience for their students'* (HEA 2008:1). The HEA's Hospitality, Leisure, Sport and Tourism Network shares best practice and works with various HM stakeholders.

It is now possible to rationalize the complete set of key educational themes that shape the HM curriculum in constructing the research instrument (Figure 3

HM Curriculum Space					
Research		**Benchmarking Statements**		**Enterprise**	
Evolving Curriculum	Vocationality	F&B Provision	Entry Requirements	Globalisation	WBL

Figure 3. Key educational issues that influence curriculum (Roberts 2014:93)

2.2 Remote environmental influences and future trends

The remote environment is '*that part of the environment that an organisation can't influence, but which can have a powerful influence on its operating environment'* (Finlay 2000:192) and this study uses DEEPLIST: Demographic, Economic, Ecological, Political, Informational, Social and Technological drivers (Finlay 2000) as a comprehensive checklist of remote environmental influences. Information technology and internationalisation are particularly emphasised as key drivers in respect of future trends in shaping the HM curriculum. The final research instrument must incorporates these elements in addition to hospitality stakeholders.

2.3 Hospitality stakeholders and power factors

The review now considers whether the shift from vocational to academic has been the result of a change in influence and power of key stakeholders and how a stakeholder identification and salience model (Mitchell *et al.* 1997) may be used to support and provide a 'fit for purpose' curriculum for the future.

Stakeholder typology and theory

This study will now evaluate key stakeholders and their fiduciary relationships to meet the changing needs and requirements of HM programmes.

Mitchell *et al*. (1997) suggest that although the concept of stakeholders is embedded in the thinking of managers and scholars, there is still no agreement on what Freeman called '*The principal of Who or What really counts'*. Mitchell *et al.* (1997) focus on three key stakeholder attributes to develop their own stakeholder identification and salience theory, where stakeholder salience is '*the degree to which managers give priority to competing stakeholders' claims'*. Starting with a broad definition to consider all stakeholders, they aim to identify classes of stakeholders by their possession of one, two or three of the following attributes:

- the stakeholders power to influence the firm
- the legitimacy of the stakeholder's relationship with the firm
- the urgency of the stakeholders claim on the firm

(Mitchell *et al.* 1997:854)

This theory produces a comprehensive typology of stakeholders: those entities to whom managers should pay attention. This theory may be a useful tool to evaluate stakeholder salience in respect of HM programmes.

In the case of HM programmes, if a systematic approach to evaluating relationships between and attributes of the stakeholders, a more co-ordinated approach could result in a more useful conversion of resources into value. The aim of Mitchell *et al.* (1997) was to produce a dynamic model to illustrate how stakeholders shift position and influence, which can have important consequences for developing strategic management decisions.

Crucial attributes

Power, and the extent to which stakeholders are able to impose their will in the relationships between organisations and stakeholder, are critical to altering the strategic balance of power. Despite the close links between power and legitimacy, Mitchell et al. (1997) argue the need in their model for separation. Urgency adds a time dynamic and concerns time-sensitivity and criticality.

Stakeholder classes

Mitchell *et al.* (1997) divide the attributes into seven types, involving overlap (Figure 4), to reflect stakeholder salience, with the proposition that the cumulative number of attributes of a stakeholder dictate how decision-makers perceive stakeholder importance.

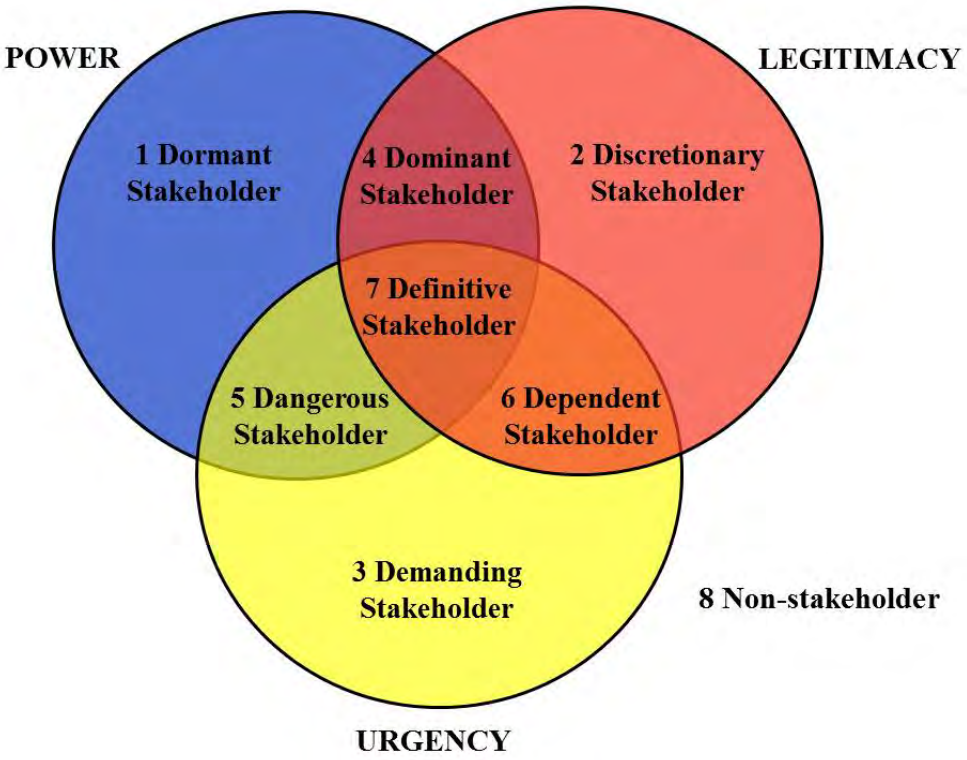

Figure 4: Stakeholder Typology: 1, 2, or 3 Attributes Present (Mitchell *et al.* 1997:874)

The lower salience classes, 1, 2 and 3 are termed 'latent' stakeholders, possessing only one attribute. Classes 4, 5 and 6 are termed "moderate" stakeholders, possessing two attributes. Stakeholders with all three attributes are termed "highly salient", being most powerful and important to the decision-maker. Non-stakeholders fall outside the categories.

Using this model to establish who or what really counts, in the eyes of leading HM academics, will expose their perception of how powerful stakeholders are, in terms of their impact on curriculum development. The research instrument can now be fully envisaged (Figure 5).

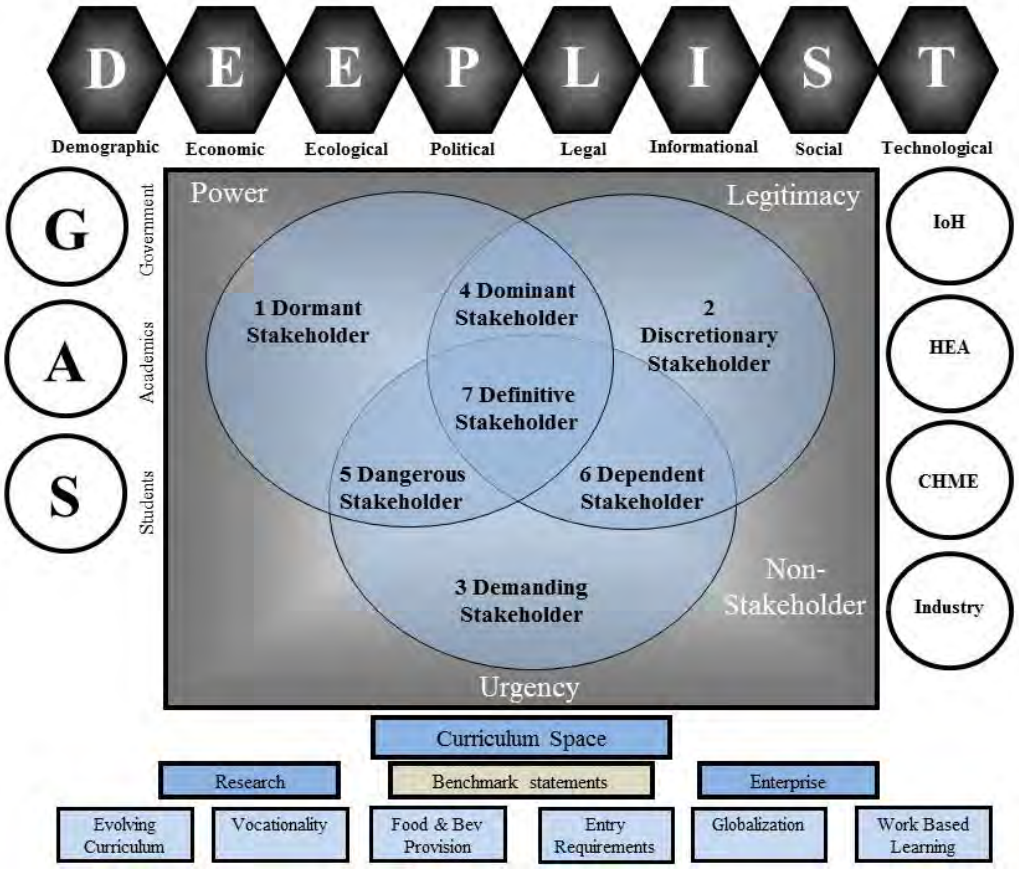

Figure 5: Research Instrument for evaluating the whole field of power shaping the HM curriculum.

Does this research instrument have the capacity to validate the adaption of White's (2011) model and so expose the relational powers operating to shape the HM curriculum in Higher Education Institutions (HEIs) in the UK?

3 METHODOLOGY

This involves the use of interactive, projective technique as an enabling tool to rank stakeholders, represented by seven moveable circular chips. Seven stakeholder chips are each place over the most appropriate stakeholder type on the Mitchell *et al*. (1997) model and a photograph taken of the outcome. Positioning represents opinions on stakeholder attributes and the subsets to which they belong. The four separate interviewees are all prominent HM programme academics who are active members of CHME and represent England, Northern Ireland, Scotland and Wales. Each of the component of DEEPIST becomes a discussion prompt, as are influences on curriculum space.

4 RESULTS AND DISCUSSION

The fundamental aim of the following evaluation of the results is to order the data into a comprehensive series of mechanisms and subordinate themes that, underpinned by power theory.

Respondents Academics / Stakeholders	1	2	3	4	Total
Academics	7	6	7	7	**27**
Students	3	2	7	7	**19**
CHME	1	4 or 7	4	6	**16.5**
Government	7	3	3	2	**15**
HEA	1	2	2	6	**11**
Industry	1	1	1	3	**6**
Institute of Hospitality (IoH)	1	1	1	1	**5**

Key

Salience Arguable	Low Salience	Moderate Salience	High Salience

Table 1: Summary of photographic results placing the stakeholder organisations into rank order using the following sub-sets (1 to 7).

White (2011) proposes ten mechanisms and he argues that these cover the whole complex field of power and so his model has been adopted and adapted (Figure 1) to manage the results. If results, arranged under the ten mechanisms proposed by White reveal dissonance between White's (2011) model and the results of this stakeholder analysis, some revisions to White's model may be proposed. Each named mechanism is defined in Roberts (2014).

Antecedent Mechanism

Following a 32% reduction in HM programmes offered across the UK between 2006 and 2011, academics adopt different solutions as they respond to stakeholder power in the attempt to balance antecedent pressures to remain vocational with academic pressures to modernise (Roberts 2014). Delivery of vocational HM programmes in HE is

being eroded. As the historical development of HM programmes is considered, it is clear that stakeholders are influenced in different ways by the two great relational powers, vocational and academic. This may not be obvious to the stakeholders because they often think they are responding to other pressures, which makes them less conscious of the opposing philosophical powers. This indicates that vocational and academic powers are operating strongly in the third dimension of power (Lukes 2005) using antecedent mechanisms. Consequently, antecedent influences are often changing the HM curriculum without educators always being conscious of the underlying academic and vocational philosophies acting as opposing relational powers to influence their decisions. Rhetoric about offering vocational HM courses is increasingly a mirage.

Educational Mechanism

While the terminology and contexts vary, the argument between educators is fundamentally about opposing academic and vocational philosophies. Liberalisation of curriculum is about increasing academic content and expanding the academic scope of the HM curriculum. This expansion opens much richer employment opportunities for graduates, both in the workplace and in post-graduate education. The objective of HM teachers in HE is to deliver an academic curriculum to non-traditional learners and develop kinaesthetic learners into academic students who use reflective practice and develop analytical skills despite their natural disposition to kinaesthetic learning. This often means achieving great strides in educational progression and produces a broad set of learning outcomes (Roberts 2014).

Educators have to approach teaching differently as institutions address the tensions created by the cost of practical facilities and the time needed to deliver vocational subjects. New university builds highlight the costs and there is a need for alternative, financially viable solutions. The practical 'hard skills' of food and beverage are over-emphasised in the views of some of the academics. Those who oppose the need for 'hard skills' argue that social trends in eating are far more important to managers than practical skills. Practical work needs to go much further than mere training and must be used much more effectively as a tool to enrich the academic learning experience.

Whilst variations in approaches to work based learning exist across the whole range of institutions, there is no debate about its core necessity in the curriculum. Arguments around the quality of work based learning experience expose opposing vocational and academic philosophies. "Some students complained they are used solely in operational skills areas and disappointed that they are not exposed to higher-level WBL outcomes" (Roberts 2014). Yet in the real world, educators and students cannot expect employers to give high-level responsibilities to students who do not demonstrate the appropriate capabilities.

HM educators are not instructed (Lukes, first dimension) to incorporate internationalisation into the curriculum, neither have they been persuaded to do so in terms that would equate with Lukes' second dimension of power. In this case, educators are preconditioned to embed internationalisation as an academic element for two reasons. First, the globalised nature of the industry, and secondly because of the recruitment of large numbers of international students. International students do not directly affect curriculum but they do have additional needs because of the amount of learning support they require because of the challenges of being educated in a second language. In addition, financial pressures to recruit these students are acting powerfully to challenge educators to get these students to appropriate standards. Persuasive power related to profit is operating to underpin and support the curriculum. There is pressure

to maintain and improve the quality of collaborative and franchise programmes. Educators, conditioned by academic philosophy, guard the academic standards. Handing over academic control to lecturers outside the UK needs to be closely monitored.

Research is very much part of the academic philosophy and integral to HE institutions. Some new universities maintain a strong emphasis on teaching in spite of the prevalent thinking in HE, which conditions educators to incorporate research into teaching. Teaching lecturers, not involved in research, are conditioned not to expect promotion. This puts the academic philosophy into Lukes (2005) third dimension of power.

To summarise, power is operating in all three dimensions in the educational mechanisms to affect the curriculum.

Careers Mechanism

It is evident from the data that opposing academic and vocational powers are operating in three dimensions through stigma and stereotyping, and are thus having an effect on the way career choices are being made. Those students that are recruited from the hospitality workplace are much more resistant to the negative influence of anti-vocational philosophy.

Employment Mechanism

The most popular discussion on the CHME linkedin discussion group epitomises the hospitality employment paradigm:

> *Why, when the hospitality industry is growing so rapidly, even during an economic downturn, are applications to Hospitality Management programmes decreasing?*
>
> (Hodgson 2013: 1)

Results identified issues relating to student numbers remaining static and reasons why. One of the difficulties identifying employment data is that many students find better employment using their degrees to work in other industries, which offer improved salaries and working conditions. The female students may be seeking employment that fits with family commitments and their aspirations in terms of employment maybe related to the flexibility of employment over the desire to commit to full time management employment.

The lack of synergy between the academics and the hospitality industry is concerning and challenging. The academics appeared to be resigned to differences in opinion on the vocational versus academic content of the curriculum. Peter Ducker, Chief executive of the IoH, addressing the CHME conference 2013 in Queen Margaret University, Edinburgh, discussed in his address to the conference the advice from a highly respected major hospitality employer on what is needed to get to the top in HM. His advice contradicted much of the argument for vocational/operational experience. The advice was to gain a good business degree, then apply for a HM position. The vocational skills will then be gained in-house.

Whatever the differences in principal, open and frank exchanges between the hospitality industry and academics are needed as the research suggests that all too often only lip service and pleasantries are taking place (Roberts 2014):

> *The future of the sector depends on the skills and talents of its staff and it needs to collectively tackle the long-term problems it has faced for a more prosperous future*
>
> *(*State of Nation 2011: 12*)*

Academics are increasingly more likely to have a social science background rather than having years of experience in the hospitality industry. They may not need 'passion' for the industry so often mentioned by industry in debate. Is the need for 'passion' a way of legitimising long hours for poor pay? Does the sheer weight of business rhetoric about indispensable passion thus serve to perpetuate poor leadership standards in the hospitality industry in general? If so, this represents a disposition of anti-academic power that is supporting the training of compliant students.

The hospitality industry includes many excellent opportunities with good pay and interesting jobs, lots of which are 'events' related but not seen by the students as having the same excitement and interest as pure events. HM academics and hospitality stakeholders are not working together to use their power and influence to market and sell to potential employees of the future. Embracing events and making a positive connection can change the perception of future recruits to the hospitality industry. This is an important argument for synergy rather than opposing academic and vocational approaches fighting for the higher ground. Powers operating in the third dimension may work in harmony though they appear mutually opposed.

Personal Mechanism

In terms of power, students are now considered by the academics to be potentially very powerful although the general consensus is that they have little idea quite how powerful they are or how to wield this power. Their personal responses showed how assessment patterns have changed to suit the preferred, often vocational, learning styles, with fewer examinations, more coursework and presentations. Students do not have the direct power to instruct lecturers to adjust vocational and academic balance before they enrol on HM programmes but the whole culture of most entry routes is vocational in character and programme leaders are aware without being instructed or persuaded directly that recruits will not opt for purely academic programmes. This represents clear evidence of power operating in the third dimension (Lukes 1974 and 2005, Gaventa 1980). Students have also shown particular interests in events as a pathway and employment interests beyond the 'assistant manager'. The power of new students exercising personal choice is driving the programme offers. This is further evidence of individual power being exercised. Embedded support systems are expected by students, which raises the issue of students becoming over dependant, which undermines the ability of students to demonstrate the key academic skill of being an independent learner. International students have separate support needs which come at a cost and they value the UK university degree award. This drives programmes toward an academic content. In future, students may have the choice regarding length and cost of programmes, which will depend on their individual demands and requirements. Home students appreciate the need to achieve a 2:1 classification to reach the interview stage for most jobs. Part-time vocational work is a major part of many home

students lifestyle, sometimes this is detrimental to academic progress. This however could be used as HM vocational experience instead of traditional placements.

Given the NSS reports are openly available for new students to review it is not surprising how seriously academics take the results for recruitment and marketing. The NSS has become the saviour or nemesis for academics in the same way that Trip Advisor has become for the tourism industry. Academic8 stated that *'they* [students] *are more important than the industry. The students like our product.'*

Student power is likely to increase with the recent increase in fees. The length of programmes, the work based learning experiences and the demand for value for money is going to prove challenging.

Thus, even in regard to individuals, the field of power surrounding the HM curriculum again reveals the two great opposing vocational and academic philosophies. Arguably, the future balance of vocational and academic approaches will be a key to the success in attracting students to HM programmes, just as it is today. Curriculum developers must recognise this field of power as fundamental to recruitment because, whether people realise it or not, students are making choices along these lines. Individuals, groups, leaders and the system itself, through the empowering NSS mechanism, is operating in complex and subtle ways, whether consciously or unconsciously, actively or inactively, to prevent or promote academic and vocational elements in the curriculum.

Institutional Mechanism

Having defined institutions as organisations having the character or function of an institution; furnished with institutions and organized entities, this section has concentrated particularly on HEIs. The discussion has focussed on a wide range of issues. The author concludes that opposing academic and vocational powers operate in all three dimensions with different outcomes in different institutions. The lack of consistency of outcomes relates to the degree in which vocational and academic philosophies have prevailed over each other locally. The necessity for a balanced, complimentary approach is understood by all academics but they have been institutionalised into quiescence about how to achieve the best balance in their individual workplaces.

There is evidence in this data and discussion that HM programmes should aim to maintain and promote a healthy tension between academic and vocational philosophies. It is this tension that maintains some of the essential distinctiveness of HM degrees in HEIs. An outward looking, confident hospitality researcher can only be produced by having a strong, independent philosophical position for hospitality. This research provides a strong theoretical foundation based on an essential synergy between academic and vocational elements. It cuts through the straw horse of adopting 'HM' as 'a flag of convenience' (Wood and Brotherton 2008:3) and puts HM or hospitality studies firmly into a coherent framework, giving it a clear raison d'etre for its existence in HE. It is a specialist management degree that aims to support improvements in the management of hospitality businesses. It does not sit in business schools to avoid snobbish reactions of the academic elite (Wood and Brotherton 2008) but because generic management modules are an essential part of the HM curriculum.

The sheer weight of universities, as institutions, serves to introduce bias in over-emphasising the academic philosophy for political, economic, cultural or social reasons. Groups and leaders operate in complex and subtle ways, whether consciously or unconsciously, actively or inactively to prevent an ideal balance being achieved between academic and vocational parts of the curriculum. The field of power in institutions can even prevent vocational interests from emerging or being articulated. This will tend to legitimise academic dominance over the vocational and take advantage of emergent stakeholder consciousness. In HEIs that share facilities with FEIs the field of power is reversed. Any consciousness of the necessity for a judicious balance does not emerge.

Systemic Mechanism

Having defined the term systemic as a power mechanism, the data has been organised in various sections to ascertain whether academic and vocational powers are exposed in terms the three dimensions of power identified by Lukes (2005). Academic power seems to be operating particularly strongly in the third dimension in respect of league tables and the relative weakness of vocationalism is particularly demonstrated in the powerlessness of the IoH.

Environmental Mechanism

Academic1, Academic2, Academic3 and Academic4 were all concerned about UK undergraduate student numbers, but anticipated that opportunities for increased international student recruitment, franchising and postgraduate work were likely to expand. Academic6 was confident that they would at least maintain numbers and remained committed to investing in a new postgraduate centre.

It is significant that power is operating in multidimensional ways in the environmental mechanism. There is an ongoing philosophical debate at government level about whether education strategists want vocational programmes in HEIs or whether they are better suited to FE. There is evidence of confusion and powerlessness of stakeholders as power operates in the third dimension. The IoH represents a large and expanding industry but fails to reconcile the differences between stakeholders. If the hospitality industry supported HM programmes in HE more forcefully, all stakeholders can collectively unite to deliver programmes that meet the vocational and academic requirements of international and home students.

Summary of Results and Discussion

The researcher is now in a position to adjust the conceptual framework and offer a model that emerges from the findings and discussion above and that may help to support hospitality management curriculum design.

There are two key issues that emerge. First, that there is an emphasis, not so much on power mechanisms, but on the extent to which stakeholders shape the hospitality management curriculum through those mechanisms. Second, the mirage of mechanisms underpinning vocational programmes is associated with induction rhetoric about the vocational curriculum. The reality is that those stakeholders who promote vocational approaches work co-operatively with stakeholders who promote academic approaches so that a balanced curriculum is achieved. Each HEI achieves a different balance depending on local conditions and the relative power of, and interplay between, stakeholders.

The researcher can now deduce that it is power, operating in the third dimension, which leads HEIs to emphasise strongly the vocational elements of hospitality management programmes at the time of student recruitment. Equally, it is power, operating in the third dimension that emphasises the robust academic nature of the outcome of having a HM degree.

After careful evaluation of the data, it was established that two of the mechanisms, Health and Legal, did not achieve prominence and were absorbed by the remaining eight mechanisms. Health and Legal issues both have an effect on the HM curriculum but they are not strongly associated with particular stakeholders so stakeholder analysis may not be the best way to expose power in these cases. The following model incorporates the constructions of the participants in the study.

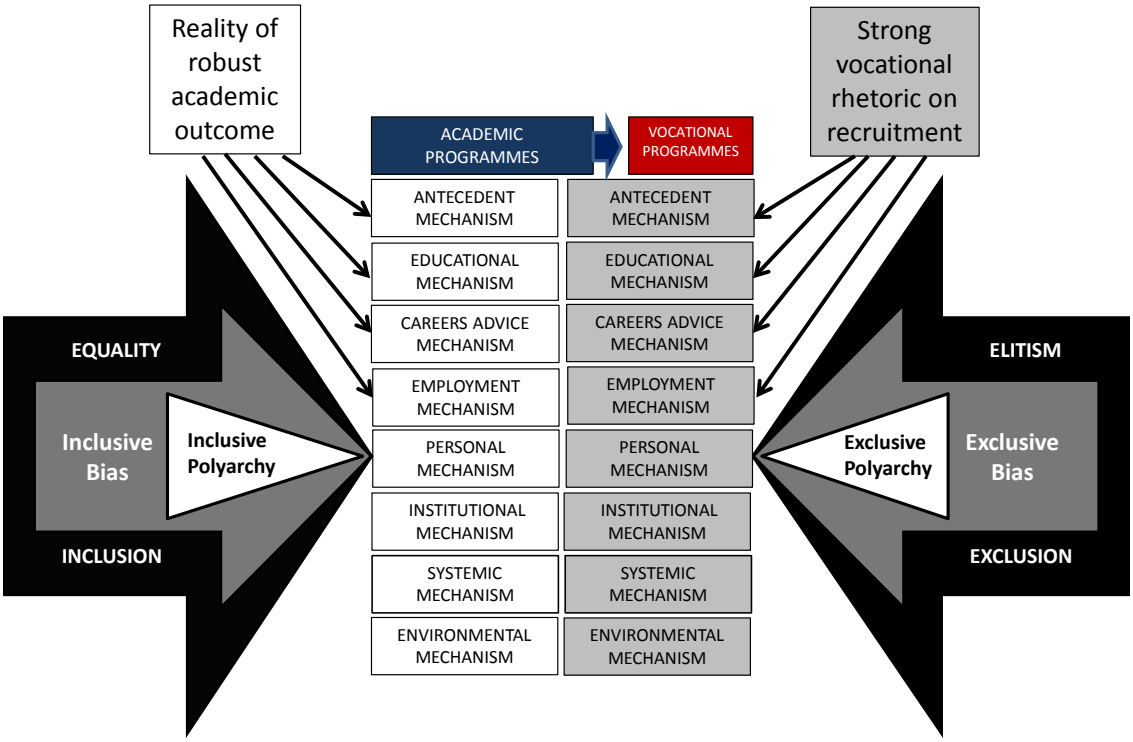

Figure 6: Model of the whole field of power affecting HM curricula showing three dimensions of power that shape the degree to which programmes emphasise vocational or academic content in HEIs through eight interdependent power mechanisms in which stakeholders operate.

Conclusions

A deductive approach using stakeholder theory to create a research instrument has succeeded in producing a power model based on White's model. Sources and dimensions of power have been identified. White's (2011:252) model is shown to be comprehensive in scope and sensitive in its capacity to test, in-depth, the hypothesis that the HM curriculum is shaped by opposing academic and vocational philosophies whose powers operate through identifiable power mechanisms. The model is shown to be generic and can be applied in a wide variety of contexts to assess power in field research. The model should be a useful tool in helping to expose bad practice in any context in which it may be applied. Problems with IWE is a case in point. Rhetoric is at variance with reality in the case of emphasizing vocational elements at the student recruitment stage, when final outcomes for undergraduates are more academic than might be advertised at recruitment.

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ADVANCES IN MANAGEMENT AND INFORMATICS:
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Identifying the Human Factors Affecting Operational Performance in an Aviation Company

J Hill, A.J Thomas, R.K Mason-Jones

Lean Six Sigma (LSS) has rapidly established itself as the key business process improvement strategy of choice for many companies. The LSS approach provides significant benefits to companies through its dual focus on reducing waste and increasing value whilst resolving Critical to Quality (CTQ) issues that affect consistency and repeatability in a product and process. The implementation of LSS is finding wider application in many different environments. Traditionally focused upon manufacturing functions, LSS is now being employed in an array of different situations with significant success.

Through a case study approach, this paper describes the novel implementation of a LSS model and outlines how it was used to identify the human factors that affect supply chain performance in an aerospace Maintenance Repair and Overhaul (MRO) facility. Due to the infancy of its product's life cycle and the unpredictable nature of repair requirements, difficulties arise in the supply chain in being able to forecast and then synchronize materials supply against customer demand. This case study outlines the application of LSS, which was successfully applied to the company where the internal operations and their connectivity to the supply chain enabled the company to achieve new and enhanced performance of its MRO operations.

Keywords: Six Sigma; Lean; Case study; Framework;

Introduction

Both Lean and Six Sigma have gained acceptance as industry recognised business improvement methods and their popularity has grown significantly (Nonthaleerak and Hendry, 2006; Schroeder *et al*., 2007). The Six Sigma approach is aimed at achieving sustained customer satisfaction through its continual focus on customer needs (Seth and Rastogi, 2004). By placing emphasis on customer requirements and, on the issues that affect customer satisfaction, Six Sigma eliminates potential performance issues before they occur by focusing on process variables that are Critical to Quality (CTQ), (Snee, 2004). The Define, Measure, Analyse, Improve and Control (DMAIC) cycle inherent within Six Sigma describes the basic logic of a data-centric process improvement approach (Harry & Schroeder, 2006, Pande, 2003, Gijo *et al*., 2011). In theory, completion of each DMAIC phase will realise project goals, improve performance, and sustain quality (Gijo & Scaria, 2010).

Lean on the other hand is a waste reduction strategy, which aims to eliminate non-value added activities and other forms of waste from a process (Bhasin and Burcher, 2006). Womack and Jones (1996), outline that the critical starting point for Lean process implementation is Value. Value is defined by the customer and in the case of this study, would mean delivering a tailored commercial aero engine MRO service to its customers at a level of quality requested within a timeframe agreed. Early attempts to reconcile the both strategies in to a unified Lean Six Sigma model was proposed by George (2002) in which was highlighted an operational framework for implementing both approaches in order to achieve parallel benefits from both.

Lean Six Sigma (LSS) therefore, aims to drive business process improvements through adopting the key features of both Lean and Six Sigma and combining these features in to an integrated approach towards business performance enhancement (Corbett 2011, Thomas *et al*, 2015). In so doing, companies focus on systematically reducing and removing waste (the lean element of the approach) whilst employing Six Sigma to focus on and eradicate the Critical to Quality (CTQ) issues that affect an organization (Drohomeretski, *et al*, 2014). In applying this combined approach, LSS aims to achieve fast flexible flow of products and services whilst systematically eradicating any issues that could adversely affect the quality of that product or service. LSS employs the traditional Six Sigma DMAIC cycle where, Lean tools can be integrated in to the phases to produce a range of benefits for the customer. Utilising the correct tools for the specific area of need will is critical to yielding the improvements desired (Thomas *et al*, 2008).

This case study outlines the application of the Lean Six Sigma method which was successfully applied to an Aerospace company. Its application was able to identify the human factors that adversely affected the performance of internal supply chain operations (Critical to Quality (CTQ) features). The CTQs were subsequently eliminated and enhanced supply chain performance was achieved. This is seen as a novel application of LSS since it focuses primarily on supply chain functions within the company rather than on the more traditional focus on manufacturing and production environments.

This paper proposes the application of LSS that combines the standard DMAIC cycle with that of the standard Lean thinking cycle to create a Framework which provides a clearer and more integrated approach to LSS application

(Andersson *et al*, 2014). This paper will therefore briefly discuss the nature and structure of existing LSS models and approaches before describing through a case study, the design and application of the new Lean Six Sigma Framework (LSSF). The main aim of this paper is to show how the LSSF was used to develop a strategic implementation blueprint and as such, the work outlines only the key details of each LSS project stage. The paper closes with an analysis of the capabilities of the Framework by accurately detailing the benefits achieved from its application.

Lean Six Sigma

LSS is gaining wider acceptance as an improvement strategy of choice in a range of industries and sectors. Traditional models and applications of LSS have focussed upon its implementation in manufacturing and production improvement environments. However, LSS is being increasingly applied with great success in healthcare (Laureani *et al*, 2013), construction (Van Den Bos *et al*, 2014) and education (Thomas *et al*, 2015). Focussing upon LSS and its application in manufacturing and production environments, most LSS implementation projects have focussed on the systematic and rigorous application of the DMAIC process on specific quality and/or production engineering based problems with solutions normally being achieved through the effective use of a number of lean and Six Sigma tools such as DOE, VSM, SIPOC and 5S (Chen and Lyu, 2009, Gnanaraj *et al*, 2012, Vinodh *et al*, 2011 & 2012, Albiwi *et al*, 2015 and Chakravorty and Shah, 2012).

Whilst the application of LSS in manufacturing and production environments is hugely popular, the application of LSS in improving supply chain operations is less well advanced. For instance, Christopher and Rutherford (2004) through an academic analysis, identify the role that agile Six Sigma may have in improving supply chain resilience. Through their work they identify the need to integrate both lean and Six Sigma approaches to form a single strategy to improve performance in the supply chain. Likewise, the work of Arnheiter and Maleyeff, (2005) outline the potential of both Lean and Six Sigma to reduce supply chain inventories and improve overall supply chain performance and throughput. However, work in this area is academic in nature and does not fully detail through application, the successful implementation of LSS in a supply chain context.

Whilst the above academic contributions provide insights in to the potential of both lean and Six Sigma to be applied along the supply chain, Knowles *et al*, 2007 propose an integrated Six Sigma supply chain model. The model proposed integrates the Balanced Scorecard, SCOR model (Supply Chain Reference model) and Six Sigma DMAIC methodology in a two-level framework with a strategic-level cycle, developing focused projects to generate maximum business benefit and, an operational-level cycle, applying Six Sigma tools in a DMAIC cycle to deliver supply chain improvements. Yang *et al*, (2007) however, offer an interesting perspective on Six Sigma in a supply chain context through a case study, which shows the application of the approach in Samsung. Through the application of the Define, Measure, Analyse, Enable, Verify, (DMAEV) approach, they highlight the design, development and application of a unique Six Sigma based methodology for the SCM domain. The paper outlines the savings and improvements made through the application of DMAEV and provides a blueprint for future implementation in other sectors and environments. Whilst these models and frameworks lead towards the effective implementation of business improvement in companies, the work is focussed upon Six Sigma and did not cover the wider issue of applying Lean Six Sigma in the supply chain. Considering these issues, this paper will detail the implementation of LSS in to supply chain operations. The case study therefore, follows the implementation of LSS in to a Maintenance Repair and Overhaul (MRO) aerospace company. Its aim is to not only systematically improve the supply chain performance of the company but also, to test and validate the LSS methodology in in a supply chain context, something which is considered a unique application in this industry. Therefore, two research questions are proposed in this work namely:

(i) *To what extent does the implementation of the LSS assist in the improvement of a company's internal and supply chain performance* and,

(ii) *What specific LSS tools and techniques are best applied to each stage of the LSS cycle?*

The Development of the Lean Six Sigma Framework (LSSF)

To provide a focal point to the development of an MRO Lean Six Sigma Framework, the authors employed an inductive approach to framework development and used the LSS model developed by Thomas *et al*, (2015) on which to create the primary foundations of this project. This LSS Framework undertook a series of major developments in an attempt to improve its effectiveness and suitability to MRO implementation. Adjustments to the framework

included redesigning the framework to change the points at which the various tools are used as well as adding a Step (0) in which preparing the company for undertaking LSS implementation was undertaken. Table 5 shows the generic form of the LSS Framework (LSSF) that was adopted in this study. The LSSF attempts to provide a more balanced approach to the simultaneous application of both Lean and Six Sigma in that the DMAIC cycle is implemented at each step in the Lean thinking cycle and proposes the simultaneous implementation of both Lean and Six Sigma in a correctly balanced Lean Six Sigma format. The horizontal axis of the LSSF in Table 5 shows the key steps of the Lean cycle (with the addition of the Train and Prepare (Step 0)) whilst the vertical axis provides the key phases of the DMAIC Six Sigma Cycle. In this approach, the DMAIC cycle is implemented at each point in the Lean thinking cycle and proposes the simultaneous implementation of both Lean and Six Sigma in a correctly balanced format. Table 6 shows the specific detail of each of the stages in the LSSF as applied to the company and the tools and activities used at each stage. This paper will now focus upon the company and then, the implementation of this LSSF. Due to extensive nature of the application of LSS in the company, only the key stages of the LSS implementation framework are covered in the paper.

Case Study – AMROA Ltd

The company in which this case study was developed is an aerospace Maintenance Repair and Overhaul (MRO) facility. Its identity has been protected on request of the company and offered a pseudonym AMROA Ltd. The facility has a global supply chain network that consists of over sixty separate vendors. Within one specific product line, seventeen repair facilities and twelve different supplier accounts are initiated in order to support engine rebuild requirements. However, due to the infancy of the product's life cycle and the unpredictable nature of its repair requirements, difficulties arise in the supply chain in being able to forecast and synchronize materials supply to meet customer demand. This in turn places pressure on suppliers to produce material at peak demand times and also, on the internal operations of the company when component stock-outs occur.

The AMROA facility has seen considerable disruption to its operational build cycle due to late material requirements. There is a high proportion of non-value added activity carried out at the facility to provide fixes for late calls caught within the MRO cycle. Any process errors disrupt the operational stability of both the AMROA shop and the supply

chain network and ultimately this has an effect on total product Order to Receipt (OTR). It is therefore important to understand the root causes of late material requirements in order to reduce their impact and remove the non-value added waste from the MRO cycle.

The AMROA workforce are undergoing a major change due to the rapid decline of the JET A engine service volume at the facility and the rapid increase of JET B engine service volume which has seen a steady increase over the last three years with further growth forecast for the next three years. JET A is now coming to the end of its product life cycle after nearly forty years of service operations at AMORA whilst the JET B engine is around ten years into its servicing product life cycle at the facility with demand continuing to grow. Forecasted shop volume figures to 2017 are shown in Table 1. Over the past 24 months there has been a major drive to cross-train the JET A engineering workforce to ensure capability of servicing the JET B product whilst ensuring the legacy engines of the JET A product line are also catered for. This has created a shared labour pool where JET A maintenance technicians are able to work across both product lines.

Table 1. JET A and JET B Projected Forecast 2014 to 2017

Year	JET A (Forecast)	% Change on Previous Year	JET B (Forecast)	% Change on Previous Year
2014	84	-	89	-
2015	73	-14%	99	+12%
2016	55	-25%	105	+6%
2017	(42)	-25%	(120)	+14%

A detailed analysis of company operations through process mapping was conducted at the start of the project. The findings of that study highlighted that the company's facility suffered from late material arriving at various stage points in the system. Focusing on the Jet B engine cell in this study, each engine within the JET B cell is repaired (and or) overhauled by being pulled through a single flow operational 'Stage' system. The stage system consists of four different stages that each have different requirements and targets that must be satisfied before progressing to the next. The stages are shown in Table 2.

Table 2 Operational Stage System

Stage 0 **(3 day duration)**	**Stage 1** **(10 day duration)**	**Stage 2** **(38 day duration)**	**Stage 3** **(11 day duration)**
The induction phase. The engine is arrives on site and all technical and customer documentation is loaded into ERP and internal network systems.	The engine is inducted into the facility and is bore-scoped, bulk stripped, module stripped, detail stripped, cleaned by module or piece part and inspected by shop floor engineering. The engineering teams are tasked with identifying parts as serviceable or unserviceable (scrap / repair required) and material reservations are created through ERP	The supply chain network is initiated through aftermarket repair and procurement. In-house repairs are completed. All material is accumulated, kitted and made available within the timeframe.	Sub and final-modules are built and the engine is shipped to the test cell for testing before shipment to the customer. Sub Assembly equates to 4 days and Final Assembly 6 days.

The target time to process a JET B engine through all stages is 62 days. As part of the strategic materials and planning initiative, a 'Phase Review' (PR) process is employed across the JET B engine cell. The impact of ensuring all operations are completed by their stage closure point is critical. If material reservations are created outside of Stage 1 closure, they are classed as a 'late call' and will place a risk on achieving On-Time in Full Repair (OTIFR). Late calls also impact hugely on the external supply chain and internal engineering operations and this ultimately leads to engine build delays. Figure 1 shows the engine Order to Receipt (OTR) map with the inclusion of several other factors critical to engine rebuild to be complete within 62 days of engine receipt and is split across four different stages. The PR process consists of two reporting points (PR1 and PR2, shown below) during Stage 2 that are designed to ensure that material reservations have been created and material has been ordered, received by the supplier, and an estimated ship date generated.

- **PR 1:** +7 days after Stage 1 closure. All material reservations are visible on the ERP BOM. The purchasing team is required to create all material purchase orders within the 7 days. Repair orders are tracked to their repair facility designations for induction.
- **PR 2:** +14 days after Stage 1 closure. All repair orders should have been received by repair facility and ship dates generated. Purchase orders have been accepted by suppliers and ship dates generated. Any material dates that do not fit targeted accumulation date are highlighted and escalated or reallocations considered.

The PR 1 process is crucial to achieving the desired results within Stage 2. It depends upon all Stage 1 processes being accurate in identifying the correct material that needs to be purchased / repaired and then creating the demands within the ERP system that generate onto a specific engine Bill of Materials (BOM). This then highlights to the purchasing team what is required. If material reservations are created outside of Stage 1 closure, they are classed as a 'late call' and could place a risk on the rebuild of that engine.

The LSSF and its Implementation

Step (0) of the LSSF was the starting point of the implementation stage and consisted of a series of awareness raising sessions in which the implementation process was outlined and where all staff were given the opportunity to contribute to the implementation process and to jointly discuss the direction of travel and, most significantly, to prepare themselves for LSS implementation (Kumar *et al*, 2011, Kumar and Antony, 2006 and Spina *et al*, 1996). Further and more focussed training sessions were introduced for staff in order to develop expertise in LSS implementation. Also, the project team delivered practitioner level training to academic staff who would need to carry out much of the developmental tasks. Most importantly, company management were given awareness sessions and an end of Step (0) meeting clarified the roles and responsibilities of the staff and the outlined the timescales and project plans for the implementation of the LSSF. Also, the staff agreed on the key Performance Measures to be used to measure success of the LSSF (discussed later in the text).

Early stage work in identifying the typical tools and techniques to be employed in the project was also undertaken at this point. The project team therefore mapped the tools and methods required for each step of the LSS cycle. The key

issue here was to minimise the over-use of tools and to focus upon a core set of key tools for implementation (these were: C+E diagrams, visual boards, process mapping, Pareto Analysis).

(1) Define Phase

In order to minimise the number and impact of late calls on the JET B engine process, the LSS project was to achieve consistent OTR and therefore aim to improve the operational stability of engine rebuild. The LSS approach was utilized to pinpoint the specific areas of weakness and vulnerability within the current operational processes throughout the four Stages (0-4). The goal was also to address the root cause of late call activity whilst targeting the goal of achieving zero late calls after Stage 1 closure. The JET B OTR map is shown in Figure 1 with the inclusion of several other factors critical to engine rebuild.

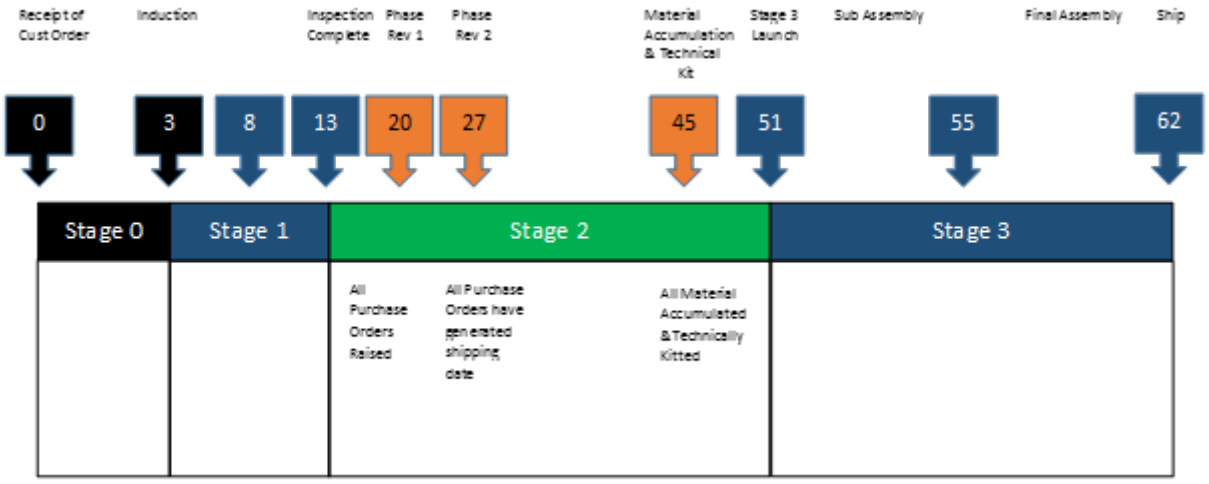

Figure 1 JET B Engine OTR Map

The project characteristic will be quantified through the number of late calls created per engine. The defect measured is any material reservation created after Stage 1 closure. Success will be measured through an identification of the late call root causes and a control plan to reduce the total late call quantity and impact. The Procurement CTQs are to have all material reservations created by the engineering team and made visible in the ERP BOM by Stage 1 closure. The Engineering Operations CTQs centre on an expectation that the engineering team members are available to

inspect and determine material requirements per engine, and ensure that the correct tooling/equipment is in place to facilitate inspection of material and ensure reservations are created within the Stage 1 window. There are three defined customers within the project spanning across three separate areas. These are:

1. Material Procurement Team: AMROA's material procurement team responsible for procuring required material within a specified timeframe relevant to JET B rebuild times.
2. Operational Staff (Aircraft Maintenance Technicians): AMROA's operations technicians who are responsible for rebuild of the jet engine.
3. End-Customer (External Customer): end-operator and manager of the engine.

The primary customer that the project will target is the Material Procurement Team who influence the total engine rebuild based on accuracy and timeliness of material purchased within the allotted timeframe. Actions here flow down and affect the operational staff that are responsible for engine rebuild. These technicians require the right material to be available on demand for efficient rebuild. Both of the above referenced customers will have an impact on the total end-customer who have inducted their asset into AMROA for MRO activity and expect return within the 62 day time window. The JET B product line experiences late calls during the repair and overhaul process at AMROA. This issue causes disruption to shop operations and is a factor linked to the high volume of material reallocations that take place on the JET B product. Further disruption can be caused to the external supply chain network and internal engineering operations at AMROA and this ultimately can lead to engine build delay. This project aligns with the consistent year on year strategic initiative of reducing JET B rebuild times and aims to improve the operational stability of engine rebuild. It intends to critically pinpoint the specific areas of weakness and vulnerability within the AMROA current operational processes.

The project was focused on addressing the root cause of late call activity at AMROA. A project of this type had not been undertaken at the facility previously and due to increasing strategic focus around JET B rebuild times it was justified as a strategic improvement project. Process output will relate to the desired goal of zero late calls and all material called in line with Stage 1 closure. The project characteristic will be quantified through the number of late

calls created per engine. The defect measured is any material reservation created after Stage 1 closure. Success will be measured through an identification of the late call root causes and a control plan to reduce the total late call quantity and impact. Table 3 outlines the project scope.

Table 3 Project Scope and Definitions

Process Output	Project Characteristic	Quantification of Project	Defect Definition
Zero late calls – material called in line with Stage 1 closure	Count of late material calls per engine	An engine can have multiple late calls during the MRO process. The number of late calls per engine is counted.	Any reservation created after Stage 1 closure is considered a defect.

The critical to quality (CTQ) factors that have an impact on the project's scope are shown in the CTQ diagram Figure 2. The CTQ drivers include:

- Procurement Operations: the purchasing of the correct material within the PR 1 timeframe that is dependent upon being identified by the accurate creation of material reservations within the ERP BOM.
- Engineering Operations: the accuracy of inspection activity carried out against a specific engine module that within the correct timeframe that can be affected by the availability of tooling or engineering equipment.

The Procurement Operations CTQs are to have all material reservations created by the engineering team and made visible in the ERP BOM by Stage 1 closure. The Engineering Operations CTQs centre around an expectation that the qualified engineering team members are available to inspect and determine material requirements per engine, and ensure that the correct tooling/equipment is in place to facilitate inspection of material and ensure reservations are created within the Stage 1 window.

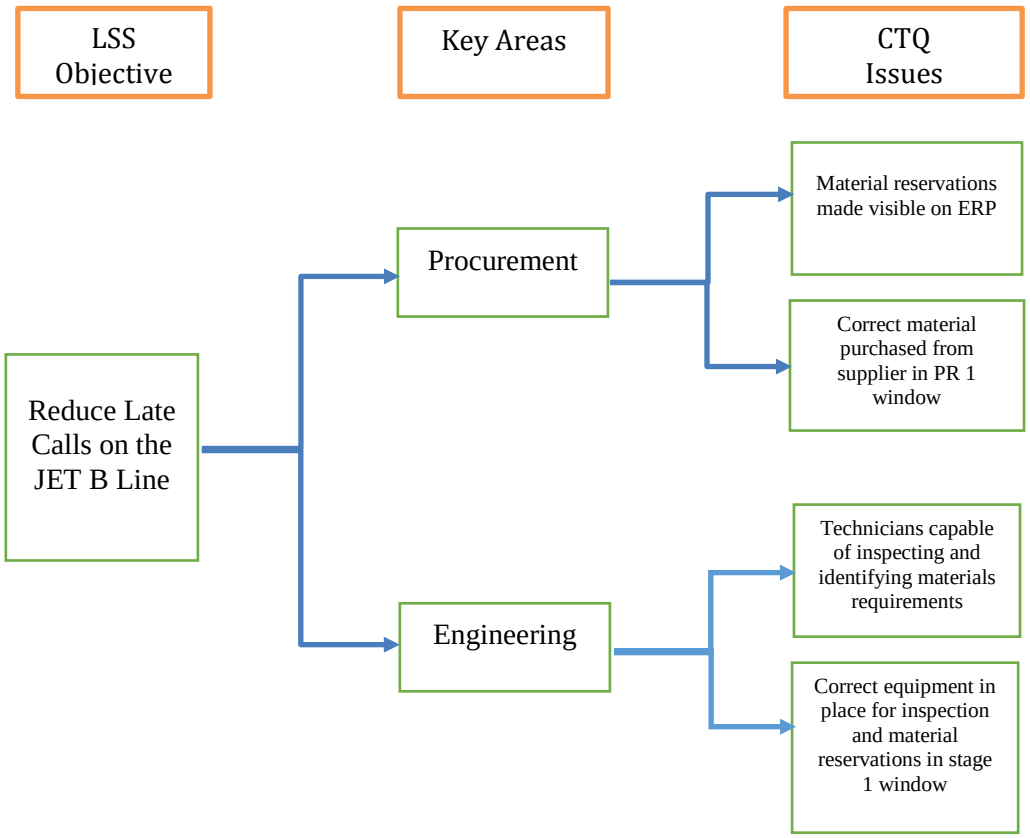

Figure 2 CTQ Tree

Figure 3 illustrates the process carried out by the engineering operation's team when deciding whether a reservation for material will be required. An explanation of the process is as follows:

- Module receipt and detail strip: individual engine module received at detail strip on day 4 of Stage 1 cycle. Module is stripped and components are dismantled to piece-part level. Engine hardware grouped by module and sent to inspection and assessment for manual inspection.
- Components inspected and assessed: technicians inspect hardware in accordance with designated engine manual and log all measurements and criteria inspected in ERP system.
- Components Serviceable: technicians collaborate with JET B product-cell engineering and determine if components should be scrapped, passed as serviceable or sent to repair assessment.
- Decision to scrap component: If the individual component is found as defective and has a list catalogue price (LCP) of less than the £2000 Material Review Bay scrap (MRB) threshold, the technician enters its detail into ERP and triggers a requirement against that specific hardware. Immediately from this a reservation will become visible on the specific engine's BOM and highlight a demand for the procurement team.

The entire process across each engine worked should take no longer than thirteen days (i.e. Stage 0 and 1). The project therefore aims *"to minimise the quantity and impact of late calls on JET B line by ensuring consistent achievement of a 13 day inspection and assessment process at Stage 1"*.

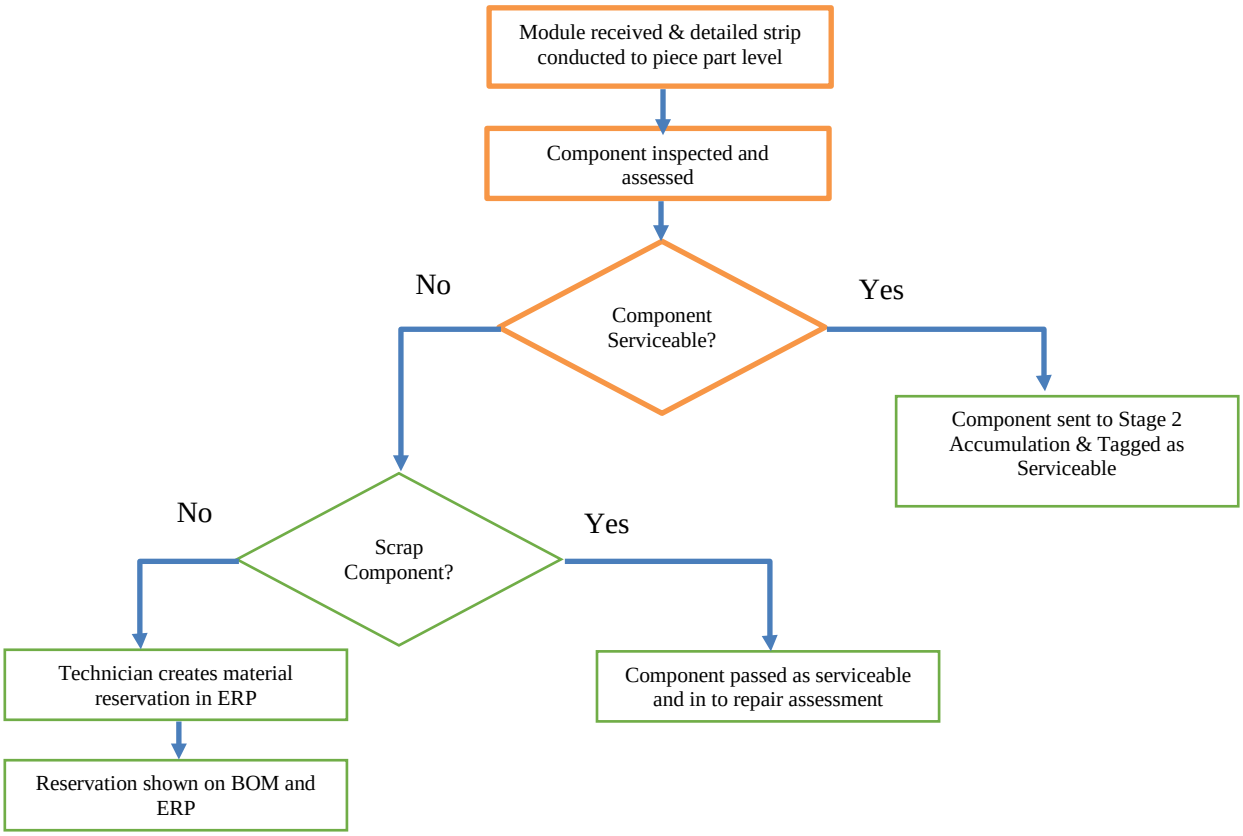

Figure 3. Material Reservation Process Map

Measure Phase

Pande *et al* (2000) recommend that the following steps should be adhered to during the 'Measure' stage of Six Sigma in order to add robustness: (1) Observe first, then measure; (2) Identify between discrete and continuous measures; (3) Reason to measure; and (4) Identify a measurement process. In reference to the four-step list above, the following actions were completed. A production walkthrough was undertaken over the course of two days. The walkthrough was conducted with a Master Black Belt (MBB) and the operations line manager (Stage Leader). The observational activity was carried through the identified customer viewpoints; material procurement team, operational staff, and end-customer. The observational activity provided a fundamental understanding of the different factors involved in the MRO production cycle and emphasised several specific areas of interest:

- *Communication:* departmental communication between stakeholders is poor.
- *Instability:* Stage 1 cycle proves unpredictable due to relative infancy of the product line.
- *Internal processing issues:* avoidable human-errors focused delays that continuously cause disruption to Stages 1-3.
- *Quality escapes:* the team identified quality escapes in the form of substandard material and paperwork provided by external repair facilities caused problems at Stage 3. Typically through the need to reallocate hardware or wait for amended documentation.

The primary data collected was downloaded from the AMROA ERP software within the facility. The primary data collected information over the previous 12 months MRO activity at the facility and this represented 86 engines. Data analysis identified the following:

- 3733 component reservations called;
- 372 different part numbers identified;
- 867 (23.22%) reservations identified as late calls.

Figure 4 presents the data captured across the Engine's 62 Day OTR. The data highlights the total number of different part numbers called and how many of the part numbers are already included in the company's buffer-stock ERP calculation. The specific modules that components have been called against are also listed within each of the zones. The data findings show that the largest volume of late calls occur during Zone A of Stage 2 (729 total) compared with the lowest volume that are identified within Zone C of Stage 3 (25 total). Within each zone there is a large variety of part numbers called across several modules. A Pareto analysis was carried out to identify where the volume of late calls occurred. The Pareto Analysis identifies that the M20 module includes 492 late calls and therefore requires primary focus followed closely by the M57, M59, M50, and M53 modules.

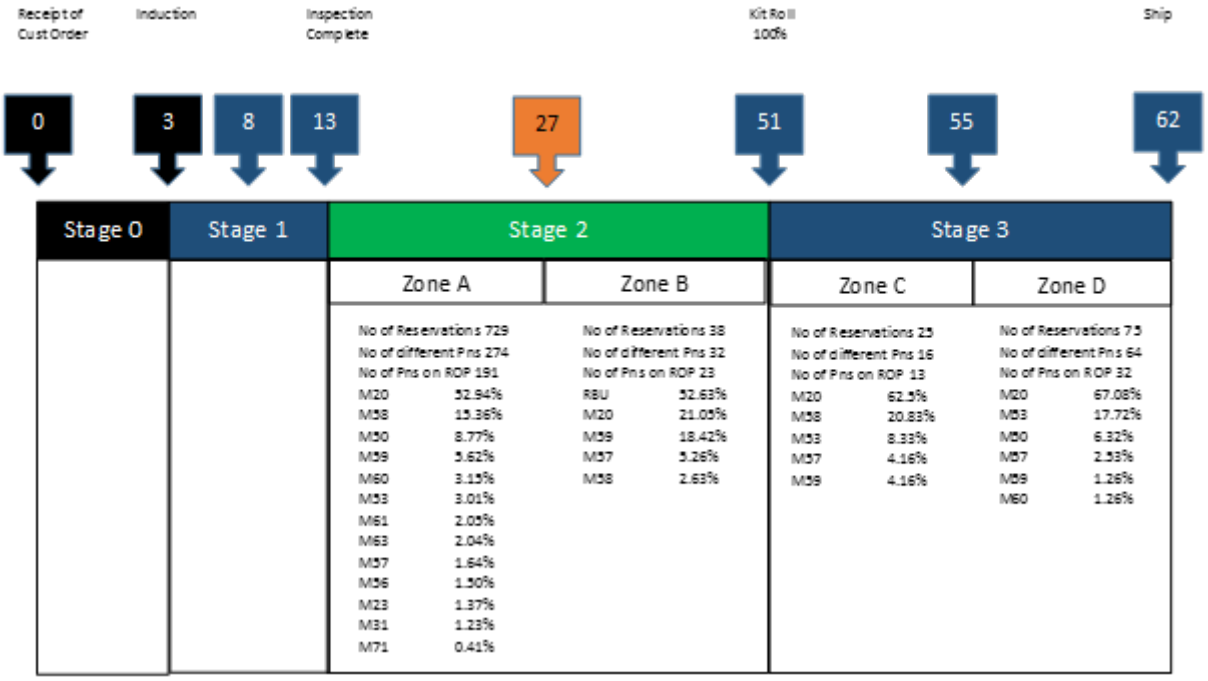

Figure 4 Engine A 62 Day OTR Map with Late Calls Presented

The Measure phase highlighted that 23.22% of reservations raised are called after Stage 1 closure and are therefore classed as defective to the baseline target of 0% defective. Segmenting the data into Zones has identified that there is a considerable spread of data captured across the entirety of both Stage 2 and 3. The data shows that there are 373 different part numbers included in the defective proportion and the majority of these lie across the five modules shown in the Pareto analysis that attribute to 80% of total late calls. The data gathering carried out during the Measure phase has offered direction for the project as it progresses into the Analyse stage.

(2) Analyse Phase

The data within the Measure stage did not explain *why* the late calls occurred and this phase aims to identify potential reasons behind this and therefore provide guidance into the Improve phase. A series of meetings were held with stage team members in order to explore the reasons why problems existed at Stage 3. During these sessions six specific areas relating to late calls were identified however, the team identified that human factor issues were considered to be

the key problem. To understand the human factor related issues suspected, missed inspection data was obtained. The data had been collated by the Stage 1 leader who tracked each missed inspection per engine that moved through the facility. The data is shown in Table 4.

Table 4 Missed Inspection Data

Contact Hours (Months)	Missed Inspections	% of Total	Number of Staff
<6	167	53%	11
06-12	76	24%	16
12-24	31	10%	12
24-48	26	8%	24
>48	15	5%	22
	Total = 315	**100%**	**Total = 85**

The data shows that there were a total of 315 late calls driven by missed inspections at Stage 1. Further analysis was undertaken to identify the reasons behind the missed inspections. Since the inspection process is undertaken by engineering technicians, the team focused their study on the technicians themselves and tracked the composition of the maintenance teams. The study revealed that of the 315 missed inspections over a 12 month period (approximately 29 late calls a month), 243 (77%) were driven by members of operational staff who had less than 12 months product maintenance experience, 31 (10%) with 12-24 months experience, 26 (8%) with 24-48 months experience, and 15 (5%) with >48 months experience. This level of analysis showed a clear correlation between the amount of product experience and, the number of missed inspections. The data further identified that there were a total of 27 new staff introduced to the JET B product line within a period of 12 months.

Senge (1990) identifies the operational issues where staff are first introduced to a new product or process. The learning rate that each staff member moves through will depend upon different factors such as process complexity and prior experience. If a process is simple, the learning rate should be less pronounced. Conversely, a complex process offers more opportunity for error. It is likely that through the introduction of new operational staff a learning curve for each individual has been evident. This is highlighted in the data whereby a total of 243 (21.06%) late calls

were created by staff within the 0-12 months experience category. This data confirms the issues raised by the team that late calls are being generated due to inexperienced engineering staff recently introduced to the Engine A product line. A cause and effect diagram was created (Figure 5) to provide a picture of the late call process variables. Six main problem areas were identified areas namely:

1. Sub-assembly and final-build operations were commonly delayed or placed on hold because material required for operational tasks was not available because it had not been requested during Stage 1.

2. Build operations were halted by substandard material received from supply chain members, or because fit dimensions had changed during product rework thus driving a need for alternative material and creating late calls.

3. Material 'fallout' was occasionally evident whereby human error had caused certain material to become damaged and non-serviceable for fitment to that engine product.

4. MLiP (Material Lost in Process) was identified as being material that had been issued from the stores department/serviceable accumulation department to a specific engine product and had been lost between accumulation, kitting or build processing.

5. The employee learning curve. Engineering Operations from each team discussed that new team members undergoing product cross-training were expected to learn 'on the job' and were therefore more susceptible to making errors.

6. Communication between the Material Procurement Team and operational staff was extremely poor. There was no identified regular flow of communication between these two teams and no process in place to identify who should be contacted within either team where an issue/query occurred.

The JET B product line has seen a steadied increase in operational staff. This has been due to a declining demand on employment activities supporting the JET A product line and a gradual need for more support on Jet B activities. Because of this, operational staff from different sections across the JET A product have been introduced to the JET B product through either permanent or cross-training activities to support demands. Further analysis showed that there were a total of 85 operational staff who have regular contact with the JET B product. The data shown in Table 4 identified that a total of 27 new staff were introduced to the JET B product line with fewer than 12 months experience. Both JET B and JET A product lines are separate and have their own individual process and although there is an element of similarity between both engine types, new operational staff that transferred from the JET A section will require time to develop the correct understanding of processes. The issue of lack of effective supervision and quality assurance procedures allowed missed inspections to go unnoticed. Whist the missed inspections did not affect overall product quality as the errors were picked up at the other stages in the system, the impact on not being able to mobilize the supply chain immediately after Stage 1 was seen as the major CTQ that impacted upon supply chain performance.

It is evident from the cause and effect diagram shown in Figure 5, that human error is common in each of the six areas. This has come in different ways such as misinterpretations of product requirements, misunderstandings of new build techniques, miscounting component quantities when issuing material, staff not abiding to Standard Operating Procedures (SOPs), and no standardised methods of communication in place. This shows that the majority of late call activity is people-based. However, variables such as ERP glitches, external repair sources providing substandard material, and tooling failing are also factors included. These factors are more uncontrollable to the AMROA team and add an element of unpredictable variation to the desired project outcome.

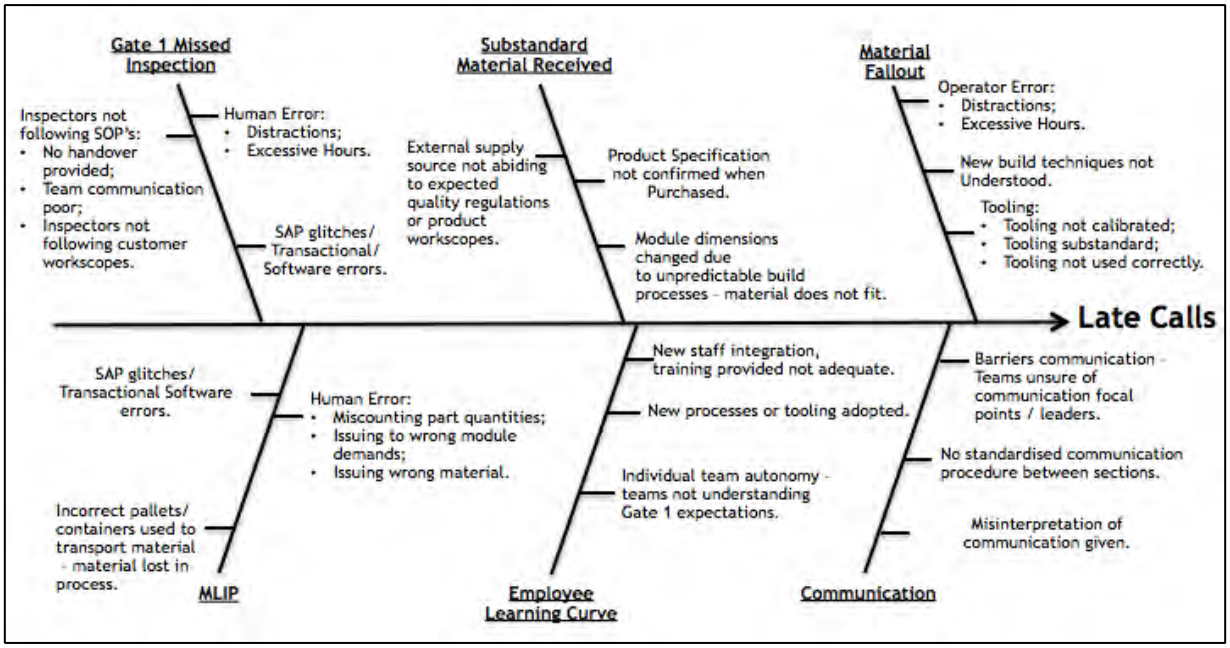

Figure 5 Late Calls Cause & Effect Diagram

(3) Improve Phase

The introduction of new staff to the JET B product line has caused instability to build operations. To stabilise the processes and reduce process variations from a staff-driven level, the management team implemented rules around the individual section teams. Each individual team would have to include 4 experienced staff (more than 24 months product experience) to every 'junior' department member (less than 12 months product experience). Each team section would also include an 'allocator' who was an operational staff section team member given the responsibility of overseeing team activities, assisting the junior team members with on-hand training and reporting daily outputs and findings to the operations management team. The allocator was introduced to provide a responsible team member from each section to link to the management level identifying any areas of concern.

Two different strategies were implemented to address the communication issues. Firstly, a standardised production board meeting was introduced each day. A team member from operational within Stage 1-3 was expected to provide updates on each product worked. The meetings centre around the developed Kanban board (Figure 6) and provide a

forum at the beginning of each day to identify actions required, issues noted, and hard points such as Stage 1 closure dates. Relevant details such as engine serial number (ESN), input date, OTR target dates, and comments are used as a standard format across both the Stage 1 and Stage 3 sections.

The Kanban board system was chosen for four reasons:

1. Visualises work that needs to be completed, highlights blockers, bottlenecks and quest and encourages communication and collaboration.
2. Offers as a Work in Progress (WIP) control tool that limits unfinished work in WIP and helps to avoid workforce management prioritisation issues.
3. Encourages flow across the product line and identifies future potential problems.
4. Drives a culture of continuous improvement and becomes an integral point for teams to measure their effectiveness by tracking flow, lead times, and quality outputs.

Furthermore, a colour coding system was utilised to provide quick visual representation of targets met versus not met, and other comments necessary. The colour coding system is as follows:

- *Black:* Target met, input date, target OTR completion date, and comments;
- *Orange:* Target date improved, actual date achieved, target recorded;
- *Red:* Target not made date.

Integrating a planning team member into the production meetings ensures that a communication link is established between the product and planning function. In doing so, it emphasises the Stage 1 closure date as the final point to which all engine module activity could be carried out. Without completing relevant work against a module in time for the closure date would mean establishing a new delayed targeted time that would not fit product OTR. A stockroom analysis was undertaken across the Pareto-identified modules. The analysis was conducted to include only C-class components (<£3000) and was used to identify current components held by the company under a buffer stock location. The analysis identified 48 different C-class components that were used on a weekly basis. These components

were cross referenced with the late call data used during the Measure phase and the results showed that 85% (41 total) components highlighted during the stockroom analysis were also included in the initial late call data. The addition of new highly consumed components to the stockroom acts as a prevention to impacts such as direct build delays where late calls have emerged within Stage 3.

Barriers included a lack of commitment from operational staff and a misunderstanding of the desired outcome. These barriers were overcome by collaborating with departmental management. By ensuring a shared need, justifying the rationale behind the desired change and mobilizing commitments, teams and sections were able to embrace the necessary changes while being guided through regular staff contact meetings.

(4) Control Phase

The process control limit was set to zero late call defects after Stage 1 closure. The operations management team agreed to conduct weekly feedback sessions in to continue focus on operating procedures and quality best practice. The procurement materials team made the commitment to analyse stockroom materials usage patterns on a monthly basis to address any new spikes in demand relating to late call activity. The procurement, engineering, and operations teams agreed to meet on a bi-weekly basis to discuss any logged late call activity and address potential root causes. The control process is still seen as work in progress and continues to be refined and improved going forward. Standard Operating Procedures combined with new supervisory and QA arrangements are enacted alongside the Kanban Board and as a result, late calls at Stage 1 are reducing significantly on a monthly basis.

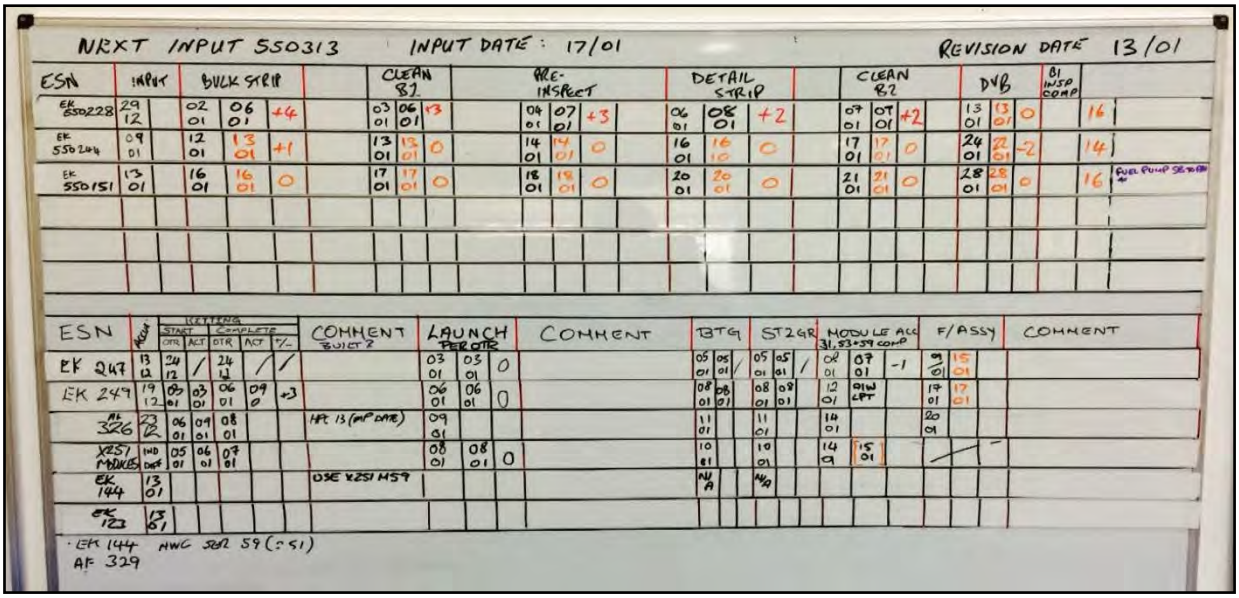

Figure 6 Engine B Production Kanban.

CONCLUSIONS

Although in its early stages of implementation, a marked decrease in the number of missed inspections and hence late call offs at Stage 1 has been seen. As a result of the new system and procedures, a drop of 53% in late calls were seen within the first month with late calls dropping from 29 per month to just over 13 per month on average. More recent results have seen more modest improvements as the system settles but, six months in to the improvement cycle has seen a drop of over 73% in late calls at Stage 1 (equating to 7 late calls per month on average). Also, due to an effective Control phase, the team has not seen any increase in late calls at Stage 1 at any time in the six months since implementation this indicating that the process is delivering stable process improvement with little variation in performance being seen. As a result of this improvement, costs are expected to reduce in the form of direct labour required as well as time and effort spent undergoing non-value added tasks such as ERP reversal transactions, repeated data loading of engine data, transportation costs within the company in the form of reallocation of modules and hardware, and the total supply chain cost in expediting material driven by late calls that is required immediately (Snee and Hoerl, 2007).

Through streamlining the MRO supply chain cycle to minimise total late calls, the business is now able to reduce its total labour costs (Bhasin and Burcher, 2006). This will come in the form of reducing headcount against the product line and reassigning the labour to a required bottleneck area, such as material incoming inspections. Through the application of a streamlined, value-focused workforce, the business is able to focus on applying value where it is required and minimising waste. It will provide the managerial team with the relevant downtime to innovate existing processes and future ideas. From an operational perspective, sectional areas such as sub-assembly and final assembly will benefit from smoother process flow without interruption (Womack & Jones, 1996, George, 2002). This reduction in defect variability will drive a better opportunity for the Engine A product line to hit its 62 day OTR requirement for each product worked and therefore will improve its ability to deliver the product to the customer on-time without incurring any contractual penalties.

The adoption of the Lean Six Sigma framework in a supply chain based MRO activity is first of its kind within the company. The project has been able to increase the knowledge base of supply chain and operations managers (Pande *et al*, 2000) whilst also impacting positively on the operations effectiveness of the company. Further work is underway in quantifying the bottom line benefits as well as rolling out the LSSF to other areas within the company.

The initial customer analysis stage involved the identification of the key variables considered important by the procurement team, maintenance technicians and, the end user. The use of standard tools such as Pareto Analysis and C+E diagramming were still seen as effective approaches to enable the LSS team to identify the variables affecting performance. The design and development of the LSSF was then key to creating a working environment around which the business improvement work could be enacted. In answering the two key objectives, the following conclusions can be made.

(i) To what extent does the implementation of the LSS Framework assist in the improvement of a company's internal and supply chain performance,

The LSSF and the application of key improvement tools shows that LSS can be effectively delivered in to MRO operations in a critical area such as supply chain and procurement functions. Whilst it can be argued that the LSSF is

lengthy, requiring the LSS teams to go through more steps than a traditional LSS programme of work, it was considered by the LSS implementation team as being more effective in simultaneously introducing the Lean and Six Sigma approaches in one coherent format to the specific CTQ. The LSS team members had highlighted the frameworks as being particularly effective without being hugely burdensome. Whilst the financial savings and business improvement KPIs are still being calculated, early stage improvements have been identified and discussed earlier in this section.

The LSSF was seen as the main change agent for the project. Feedback from the management team showed that the improvements adopted by the procurement and supply chain team would not have happened unless the LSSF system had been adopted. Furthermore, staff motivation was seen as having improved as a result of having a greater say in the development of the LSS project improved as their voice had been seriously considered and their suggestions taken on board.

(ii) What specific LSS tools and techniques are best applied to each stage of the LSS project?

The balanced approach towards multiple stakeholder analysis was seen as being particularly effective and that the C+E diagramming, Pareto Analysis and, the subsequent focus on the human resources element of the project was very useful in developing a robust statistical platform for basing improvement actions. Whilst it is too early in the improvement process to total the sum of the savings and improvements, the company's management team found the exercise to be key in initiating and driving change in to the procurement and supply chain areas (where previously Six Sigma had only been applied specifically to MRO operations). Roll out of the LSSF programme is being considered for further areas within the company.

	Lean Cycle Steps						
Six Sigma Cycle Phases		(0) Train& Prepare	(1) Specify Value	(2) Synchronise Internal Value Stream	(3) Create Flow	(4) Pull on Demand	(5) Create Perfection
	Define	Institute departmental wide training in LSS ensuring full preparation in both tools, techniques and management development of LSS leaders. Set goals and expectations and establish roles and duties for staff Routinely monitor key business parameters in order to identify early issues which can be worked upon at stage 1 project start.	Define the company's value proposition.	Define the company's value stream in relation to the gap analysis undertaken in stage (1)	Define the flow pathways through the system. Identify the constraints that inhibit flow through the system	Define the conditions required to achieve pull on demand. Define supply chain capabilities etc	Determine whether new state is operating to the design intent outlined in Stage 1 of framework. Define future conditions for improvement
	Measure		Measure the value proposition against customer's understanding of Value.	Use process mapping or VSM to determine how aligned the value stream is to customer expectations.	Determine the impact of constraint removal on system by assessing the level of potential improved performance.	Measure the potential impact on being able to Pull on Demand (PoD). Determine the ROI and ROCE for the PoD system employed.	Determine the gaps in performance between new state and the design intent. Ensure consistency of performance
	Analyse		Determine the gap that exists between the value proposition and the customer's concept of value. Understand the gap	Identify the key constraints in the system and features required to change within the Value Stream	Identify the constraints that need removing and develop implementation plans for removing constraints	Identify the issues within the system and in the supply and demand chains that need resolving and develop plan for implementation	Identify the constraints that limit the new state from reaching design intent. Analyse how any new improvements can be achieved for future development.
	Improve		Develop plans to bridge the gap between company and customer value perceptions	Implement a change management programme to align value stream with customer requirements.	Implement the plan and remove constraints from system.	Implement the plan. Test to ensure conditions for PoD are correct. Adjust and iterate to ensure system performance is achieved.	Systematically improve system to meet design intent. Outline improvement plans to drive further levels of performance. Feed forward to stage 1 of next iteration
	Control		Design in control plans in to Improve stage to ensure sustainable change is achieved	Ensure control plans are in place to maintain the gains and that the VS is continually aligned to customer expectations	Ensure that system maintains the gains from constraint removal. Ensure that system is not allowed to fall back to previous state	Monitor and manage system conditions and new state. Take remedial action to ensure optimal performance.	Set new process specifications and manage the new process order.

Table 5. The Generic LSSF Framework

Table 6. Completed LSSF Matrix indicating the key tools and techniques

		Lean Cycle Steps					
Six Sigma Phases		**(0) Train& Prepare**	**(1) Specify Value**	**(2) Synchronise Internal Value Stream**	**(3) Create Flow**	**(4) Pull on Demand**	**(5) Create Perfection**
	Define	Institute departmental wide training in LSS ensuring full preparation in both tools, techniques and management development of LSS leaders. Set goals and expectations and establish roles and duties for staff. Routinely monitor key business parameters in order to identify early issues which can be worked upon at stage 1 project start.	Managers focus on the issues around late OTR on JET B product line.	Missed inspections identified due to inexperienced staff seen as key CTQ	62 Day OTR is defined as major KPI. Missed inspections impact adversely on this KPI.	Design system to pull through gate stages to meet client expectations of a 62 Day OTR. Use **ToC** analysis to identify and remove constraints.	Define optimal stage within system. Set new target of 59 Days OTR following consistent 62 Day OTR is achieved
	Measure		Analysis of the strip and build process developed through **process maps**. Supply chain instability identified	Detailed analysis of the missed inspection issue is undertaken (**Pareto Analysis employed**) to understand the impact of the problem	Monitoring undertaken to ensure that the rate of missed inspections is reducing. Impact on 62 Day OTR is measured	Measure stage gate performance to ensure gate flow meets 62 OTR	Continually measure system performance to ensure OTR levels are consistently achieved. Focus on driving down OTR from 62 to new target levels
	Analyse		**C+E diagramming** used to identify six key areas of focus.	Missed inspections directly correlated to experience of workforce	Stage gate analysis is undertaken to ensure that late gate arrival has been resolved with now variation in arrival times.	Analyse the issues that cause stage gate flow problems. Systematically remove constraints from gates	Analyse how OTR can be reduced o new target level of 59 days.
	Improve		Group set up to consider the key CTQs and how to resolve the issues	Plans developed to enhance training and experiential learning of staff	**Kanban boards** used to ensure that late gate arrivals are monitored and action taken	Implement plans to resolve stage gate flow problems	Establish LSS **blitz** teams to systematically improve delivery and manage client expectation
	Control		LSS champions established to drive improvement programmes	Shop floor supervisors to monitor and control team compositions and to monitor progress	Kanban boards used to control system on daily basis. Training and new team compositions are used to control improvements.	Manage new order and embed practices to ensure consistent stage gate and OTR delivery to standard	Set new process specifications and manage the new process order.

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